Feb. 9, 1914

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THE AMERICAN GAS LIGHT JOURNAL INC.

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Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

Pittsburgh

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THE UNITED GAS IMPROVEMENT COMPANY,

PHILADELPHIA.

BUILDERS OF

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

ACCURATE MEASUREMENT

OF

AIR AND STEAM SUPPLY

(PATENTED),

AFFORDING { PERFECT CONTROL OF GENERATOR FIRE CONDITIONS.

PRODUCING { UNIFORM RESULTS. HIGHEST EFFICIENCIES.

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Report of Committee on Outdoor Lighting, N. C. G. A.[1]

[Submitted by MR. A. H. HUMPHREY, Chairman.]

Prior to the introduction of the electric arc (1878) outdoor lighting was done almost exclusively by gas lamps. Open flame street lamps of 10 to 20-candle power, used singly and in clusters, were supplied by gas companies and maintained under contracts with municipalities. As cities grew, the demand for greater street illumination increased, and, when the electric arc was introduced, open flame gas lighting was rapidly displaced, by reason of the greater intensity of the new illuminant. Competition between gas and electric companies for street lighting was very keen; but, owing to the lack of a gas unit equal in intensity to the electric, gas street lighting became largely confined to residential districts. This field in turn was endangered by the subsequent introduction of incandescent electrics, and in competition with these units, the open flame gas burner was at a serious disadvantage, and, having to materially increase the unit gas consumption, to produce larger flames and higher candle power, without a corresponding increase in revenue, street lighting ceased to be profitable for gas companies.

The introduction of the incandescent mantle wrought many changes in conditions. It regained for gas much of the business that had been lost, and soon caused an increase in gas units employed. Its use increased the luminous efficiency of gas more than threefold, and as the gas or current is the largest item in the cost of operating outdoor units, the efficient incandescent gas mantle became the chief competitor of electricity for outdoor lighting.

Commercial development has brought a demand for increased lighting in store districts, and there is demand for three forms of outdoor lighting: (1) Commercial, or store front; (2) business district improvement; and (3), municipal street lighting. The use of gas units is possible and practical for all these forms.

Commercial outdoor lighting embraces lamps in front of stores, churches, halls, amusement parks, tennis grounds, signboards, trainsheds, docks and alleyways. Lamps are manufactured to-day which will do this class of lighting in thoroughly practical, efficient, pleasing and economical way, and it is one of the most valuable forms of business that gas companies can secure, not displacing other gas lighting, and is one of the best advertisements for the company. The public seldom see gas ranges, water heaters, engines or industrial fuel appliances in operation as they pass through the streets, and if they do they have no means of estimating the efficiency of the appliances. Neither is residence lighting generally exposed to the public view. Interior store lighting is seen by the public and plays an important part in demonstrating the quality and value of our product, but not so much as outdoor lighting.

It is doubly important that outdoor lamps be properly maintained, for all that has been said in favor of them as an advertising medium for gas is reversed, if they are neglected and allowed to get out of order.

Your Committee has collected photographs of installations of outdoor lamps and has sent numerous circular letters to companies throughout the country. The following is an abstract of eighty replies received:

Do not handle outdoor gas lamps of any kind.....	12
Install and maintain lamps at a monthly rental.....	34
Sell outdoor lamps to consumers	26
Companies both selling and renting lamps.....	8
Total.....	80

The following table gives an idea of the monthly charges made by those companies that rent lamps to consumers:

1 company furnishes and maintains lamps free.
5 companies rent and maintain lamps at 25c. each.

2	"	"	"	"	"	"	35c.
1	"	"	"	"	"	"	45c.
18	"	"	"	"	"	"	50c.
4	"	"	"	"	"	"	75c.
3	"	"	"	"	"	"	$1.00

The average charge is 51 cents per lamp per month, and of this about 35 cents is credited against the cost of maintenance and 16 cents for depreciation on the lamp. Sixty-eight of the companies reporting, supplying a population of 4,458,000, have in use 9,209 outdoor lamps. The average rate for gas in these cities is about $1 and electricity is sold at approximately 10 cents per kilowatt hour. In reviewing the reports the Committee formed the opinion that neither the location nor size of a city, or the cost of gas or electricity, has much bearing on the number of lamps that can be put in service.

The best average reported is from a company in a small New Jersey town having a population of about 6,500, which has in use 125 outdoor arc lamps, or 19 lamps to 1,000 inhabitants. If it were possible

1. Slightly abridged.—EDS.

to secure as good results in all the 68 cities the total number of outdoor arc lamps installed in them would be 84,702, as compared to the 9,209 actually in service.

The second city in rank has a population of 57,000, and 900 outdoor lamps, or 16 to every 1,000 inhabitants.

The third best result is a city with a population of 82,500, and 988 outdoor arc lamps, or 12 to every 1,000.

A city of 36,000, with 300 lamps in use, or 8 lamps to 1,000 population, stands fourth.

The fifth has over 600,000, with 2,025 outdoor lamps, or a trifle over 3 to 1,000 inhabitants.

The following table gives the terms on which lamps are installed in the five cities:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Population	6,500	57,000	82,500	36,000	600,000
Outdoor arc lamps.	125	900	988	300	2,025
Sell	Yes	No	No	No	No
Rent	Yes	Yes	Free	Yes	Yes
Rental per month (including maintenance)	50c.	50c.	Free	25c.	$1.00
Maintenance per month, lamps owned by consumer	25c.	....	....	....	....
Price of gas per M..	$1	$1.20	$1.15 to .60	$1	80c. to 60c.
Price of current per k.w.h..	10c. to 4c.	7c.	6c. to 2c.	10c.	4c. to 2c.

Note that the greatest numbers of outdoor lamps are not where the gas rate is low and electricity high. Probably more outdoor arc lamps are installed where the electric competition is keen, greater effort being made to secure this business.

It is possible to lay down a set rule for securing outdoor gas lighting business. On two general plans lamps are installed: (1) Renting the arcs; and (2), their sale to the consumer.

There is difference of opinion on the subject, and we have spent considerable time in discussing the merits of each plan. The figures seem to indicate that the more liberal plan of renting arcs results in installing more lamps, as generally the cities reporting the best results use this plan. It gives the gas company control of the maintenance, insures against neglect and inefficient service, and makes up largely for inefficient selling organization.

We believe, with a properly trained organization, it is better to sell lamps on long-term payments, the payments including maintenance. This plan has the advantage that the consumer is not required to make any large payment at one time; while he is paying for the lamps the company is maintaining them, and there seems an advantage in having him understand he is paying monthly for something he will own. It keeps him interested to continue using the lamps, and he is not as open to the arguments of salesmen for competing illuminants.

Success for the sale of gas for outdoor illumination, however, does not depend upon sales' plan, but upon the effort expended in going after the business. It is business in which the gas company directly meets competition from electricity, and it is necessary to have men capable of explaining the merits of gas for exterior lighting, and of combating the arguments of competitors; also, men who understand wherein lies the value of outdoor gas arc lamps to the consumer.

Choose from your salesmen those who will make a study of the advertising value of brilliant store-front lighting from the merchant's standpoint, bringing to his attention that the public goes where there is the most illumination. It is essential they be men capable of getting the better class of business, for in securing these the smaller stores will imitate and follow.

It is difficult to get the first-class, if they only see it used in front of the poorer stores. An installation on a bank, hotel or large store will add value to your product and encourage others to adopt it. Frequently a sketch or drawing of the store front, showing it illuminated with the lamp that you are selling, is a forceful argument when going after business.

The first 100 lamps are hard to put out, but if you have installed such a number in a proper manner and give them proper care, the balance of the business comes easier.

An enthusiastic and energetic campaign for outdoor lighting will bring you results. You can educate the merchants to consider lighting the exteriors of their stores, as much a part of their equipment as the lights in the interior.

It is important, whatever plan or method you adopt, to secure outdoor lighting, that it be based on principles that will make the installation stick; that will give you satisfied consumers, and aid in securing additional business. The installations should be a credit to the merchants, to the city and to the gas company.

It seems the tendency, because of the advertising value of exterior lighting, to attempt to be too spectacular. Securing a new installation regardless of cost, taking a photograph of it and sending it to a trade journal, is not necessarily good business if the installation is not practical or permanent. Do not overdo a good proposition by putting in more lamps than are necessary. To do so is bad artistically and cheapens the appearance of your installation. Remember, if you install lamps and they are not used, they are a detriment to you, a bad advertisement. To get and hold outdoor lighting the effect must be pleasing to the eye.

Maintenance.—The table shows charges for maintenance where lamps are owned by the consumer:

17 companies charge	25	cents	per month, each.
5 " "	35	"	" "
1 company charges	40	"	" "
11 companies charge	50	"	" "
Average	35	"	" "

This probably represents about the actual cost of maintenance to the gas company.

Your Committee is of the opinion that under no circumstances should outdoor arc lamps be installed unless the gas company is prepared to maintain them, making regular inspections and supplying necessary mantles, glassware and other material. There are several reasons why outdoor lamps require more care than indoor lamps; the first (and most important) being that they are exposed to the weather; second, the merchant is more liable to neglect outdoor lamps, as the illumination given is not absolutely necessary, while artificial illumination is essential in the store interior, and he will make some effort to keep the indoor lamps in working order; third, being exposed to the public view, when out of order they give very adverse publicity to the service the gas company is giving.

Nothing else can do as much injury to the business as neglected outdoor arc lamps. We believe it good business for a gas company to replace lamps for customers, junking them if necessary, rather than allow them to hang in front of stores with broken globes, dirty globes, no mantles, or otherwise not in condition to be used.

Installation.—It is noticeable in inspecting installations of gas arc lamps in various cities that many have been put up without apparent thought as to appearance of installation or size of pipe necessary to give a good supply. We have seen lamps on prominent store fronts supplied by ¾ inch pipe extended over the sidewalk from 3 to 10 feet. Sometimes additional support is given by 2 strands of wire fastened to the building, the wires twisted to any old shape in order to complete the job in the easiest or quickest manner. In some jobs no thought is given to the sagging of lamps or pitch of pipe to prevent traps, and in many cases the piping is not painted to prevent rust.

We all know that lamps are so installed, and that many lamps are taken down, even though the lighting was satisfactory, because of the appearance of the installation, particularly in the daytime.

Fig. 1 shows an outdoor arc lamp in front of a corner saloon.

Fig. 1.

While possibly, when the lamp was installed, the piping job was in keeping with the surroundings, such unsightly piping jobs are seen by the passing public and do much to discredit outdoor gas lighting. Piping to outdoor lamps should never be less than ¾, preferably 1 inch or 1¼. It is essential that it be neat in appearance, that pockets and traps be avoided, and that it be neatly painted after installation.

We are far from taking advantage of the possibilities of exterior gas lighting, and much of the lack of result is due to unsightliness and impractibility of piping installations made. Gas arcs are unquestionably efficient for exterior lighting and they can be installed properly. It has been clearly proven that companies can secure outdoor lighting business by following a policy of good installations.

We, therefore, recommend that all outdoor arc lamps be hung from neat and artistic piping or brackets. For ordinary stores an inexpensive bracket or pipe is perfectly satisfactory, but for the better class of buildings fixtures should be ornamental, cost being the factor least considered. Between these two classes of stores fixtures should be graded to suit the architecture of the building and the nature of the business.

Fig. 2 is the front of the First National Bank, Scranton, Pa., showing an installation of two 5-burner outdoor arc lamps, on cast-bronze brackets, which cost the consumer $255 each. The ventilators of the lamps are covered by perforated bronze castings and the installation harmonizes with the architecture of the building. These lamps have been in use for three years, lighted every night, and are familiar landmarks to the residents of Scranton.

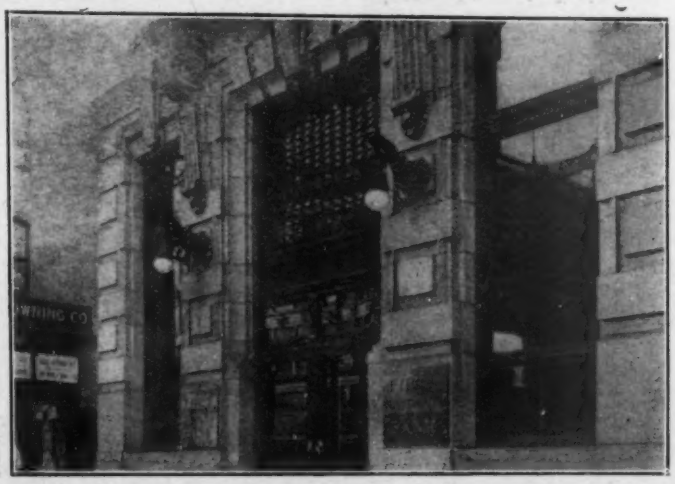

Fig. 2.

The exterior of the Dime Savings Bank (Scranton) is shown in Fig. 3. Its front is illuminated by ten, 5-burner arcs, on specially designed fixtures which cost $65 each. Installations of this kind produce definite results as proved by observing the business places in the city. There are hundreds of outdoor gas arc lamps in use in Scranton, all installed in a manner in keeping with the building.

Fig. 3.

The exterior of the Jefferson Hotel, St. Louis, Mo., is illuminated by twenty-seven 5-burner, outdoor arcs in use for past 2 years.

Fig. 4 is a prominent corner in Portland, Ore., illuminated by outdoor gas arc lamps.

Fig. 5 is a prominent hotel equipped with twenty-eight 5-burner outdoor gas arcs.

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Outdoor Gas Arc Lamp Efficiency.—The high efficiency of the inverted gas arc lamp is due to the natural downward direction of the light rays. It is not generally known that gas arc lamps properly constructed show decidedly increased efficiency over the usual single-mantle lamp, which appears as a result of bringing the air down through the heated top of the lamp to the mantles, and pre-

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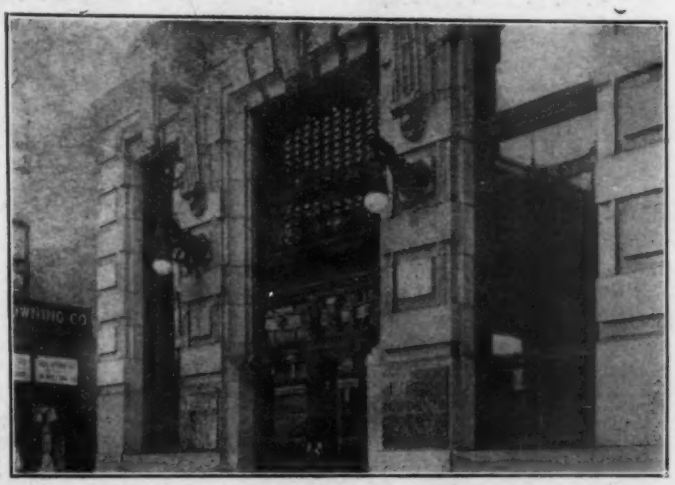

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Fig. 7.

Fig. 8.

heating the gas and primary air. This is readily observed, for when first lighted they increase in efficiency as the lamp is heated to the highest temperature obtainable. It is found in laboratory tests that the 5 burner arc is more efficient than the 3-burner arc of the same type, other conditions being equal, because of the greater heat from burning more gas.

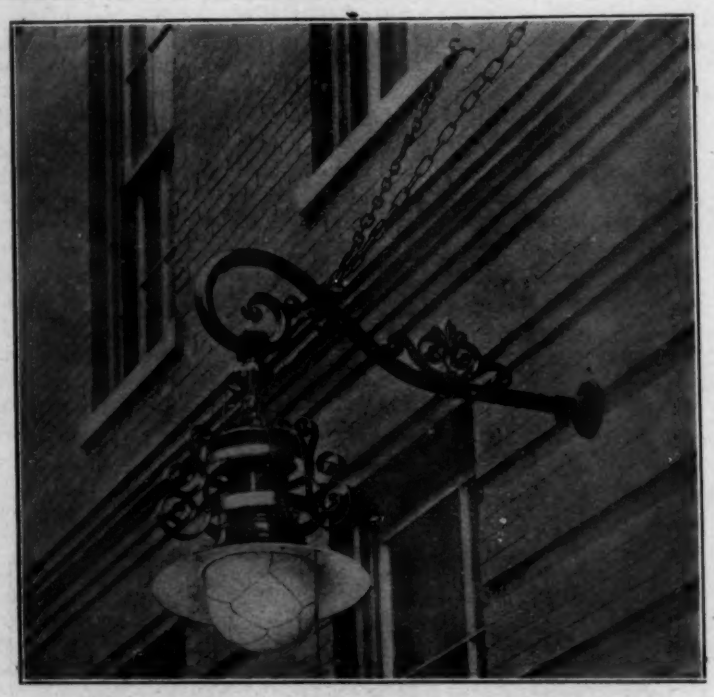
The success or failure of outdoor gas lamp lies between the manufacturers of the lamp and the gas companies. While it is fairly easy to construct a lamp that will work satisfactorily indoors, it is not so easy with the outdoor lamp. A gas lamp to give the best results must be fully vented, but with the outdoor lamp this is difficult to do, and at the same time withstand all weather conditions. One of the troubles is to secure a metal that will stand. The globe is subjected to great heat from the interior, and the rain and snow, striking the exterior, result in a greater breakage than with the indoor lamp. The lamps are constantly jarred by winds, and this, of course, breaks mantles.

Manufacturers of lamps try to give the gas companies lamps that will stand up and yield service, and the companies should give the manufacturers the benefit of their advice, and details of conditions under which the lamps do not prove successful.

One improvement which would aid materially is a glass globe that will withstand all weather conditions, and until such glass is furnished we recommend the use of wire guards. A more reliable pilot light, or other means for positive igniting and extinguishing, is necessary; also, some means for positive distance control. The manufacturers realize what is needed, and hope to develop something that will meet these conditions. The lamps now sold have proven commercially satisfactory, but we recognize possibilities for improvement.

One of the Committee suggested there is a field for a single-mantle lamp giving about the candle power of the 3-burner arc.

There is need of a compact, artistic, single burner, outdoor gas lamp for residence porch lighting, preferably one that can be controlled from inside the house. It is conceded that electricity has advantages for some forms of decorative lighting, but where good illumination is required there is no reason why gas should not successfully compete and, if sufficient energy be expended, secure the bulk of this business.



Bent Iron Pipe Brac' et and Scroll Top Piece for Outdoor Arc.

Pipe Bent Bracket in Front of Church.

Flat-Rate Lighting.—Only three of the companies reporting place lamps on a flat-rate basis, but they show it is a very good plan on which to install outdoor lamps. A customer will often agree to pay a stipulated price per month for a certain number of hours' lighting, when he hesitates to buy gas through a meter. With lamps on a flat-rate plan he knows exactly what he must pay per month; the lighting and extinguishing are out of his hands, and a stipulated income per month is assured to the gas company. The gas, in the cases brought to our attention, is metered and placed on the books at the regular rates, to enable the company to check the quantity the lamps are consuming and the profit from their installation.

High Presure Lighting.—Increased efficiency is gained by the use of high-presure lamps, and this method of lighting will find a permanent place in the commercial outdoor lighting of the future. To date, however, this country appears to regard it in the experimental stage.

From a commercial standpoint the disadvantages have been: (1) The cost of the special equipment to increase the presure and upkeep; and (2) the high cost of lamp maintenance. With these expenses the opinion of many of those who tried this form of lighting is that little efficiency is gained per dollar expended.

In Europe, where special pipes are laid for street lighting and gas delivered under high pressure, there seems a great future for this type of lamp. In America some companies with high pressure distribution systems have installed high pressure street lamps along their mains with satisfactory results.

Combination Companies.—Combination companies have few outdoor gas arc lamps in use, some stating they only sell electrics for outdoor lighting. This is a mistake, for in any city you find streets almost barren of outdoor lighting. It is impossible for any company to secure all available exterior lighting by electricity, and that business which combination companies cannot secure with electricity should be solicited for gas. This would not interfere with the electric business, but would have a tendency to educate merchants to the advantages of illuminating their store fronts, and such education will bring results to the electric as well as the gas end.

The Outdoor Lighting Fixtures for a Bank.

Business District Improvement Lighting.—Figs. 9 and 10 show district improvement street lighting by means of gas arc lamps suspended from ornamental posts.

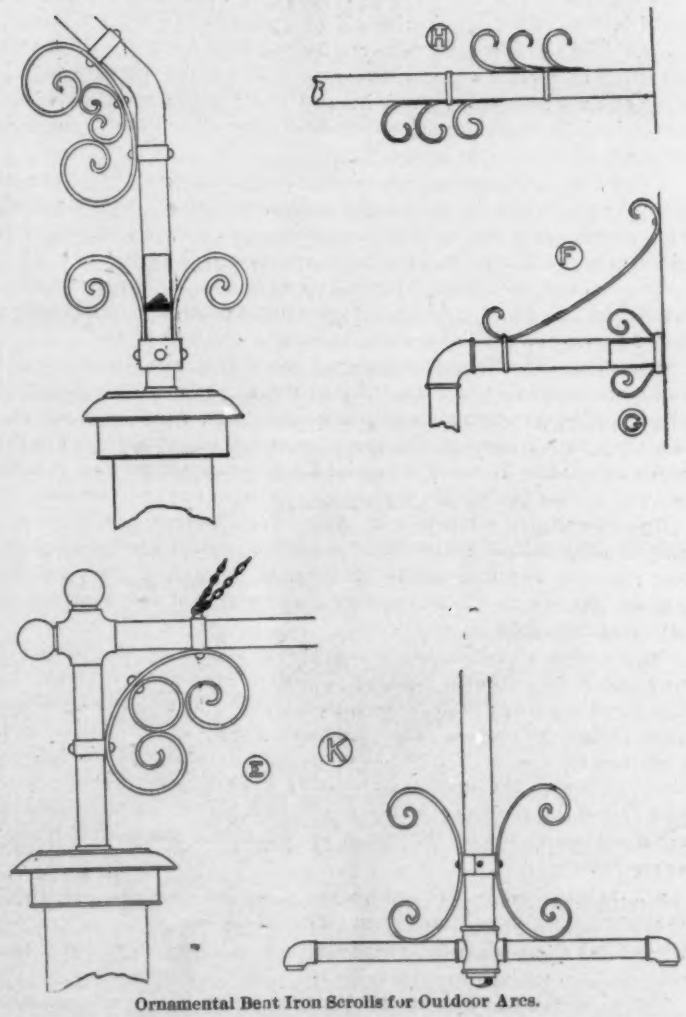
This is difficult business to secure namely: (1) The electric companies are particularly anxious to get it making low rates because of the long burning hours; and (2), it is necessary to do business with a number of individuals to secure the contract.

The first step is educating the merchants to the advertising value of the installation. While much of this lighting is being paid for by municipalities, as a general thing the first installation was made by the merchants in the district, and later the municipality took it over, and extended the system to other parts of the city.

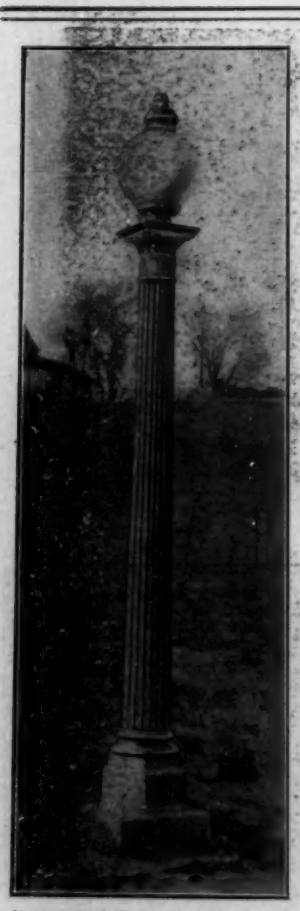
Electric lighting of this kind is generally done with small candle power lamps, and they have educated the public to expect ornamental lighting rather than good illumination. It is generally spoken of as "ornamental street lighting." This disadvantage the gas company has to overcome, for there is at present no gas unit of as low a candle power as the electric lamps used. As the lamps are lighted each night until 11 or 12 P.M., and in some instances all night, the electric companies are in a position to make a low rate; but that it is possible to secure the business with gas has been proven by some companies securing it. If any big success is to be secured it is necessary to develop a lighting unit, ornamental, of low maintenance cost,

Fig. 9.

Fig. 10.



Ornamental Bent Iron Scrolls for Outdoor Arcs.



Ornamental Post Equipped with Single Mantle Upright Lamp.

and of fairly low candle power. It is also necessary for the gas companies to make rates proportionate to the volume of this particular business, as they cannot hope to secure the business on their rates to small consumers. In addition to the profit from this form of lighting it unquestionably is of good advertising value.

Municipal Street Lighting.—The introduction of the incandescent gas mantle placed the gas company in position to again secure street lighting business. The old type of lamp with the open flame burner was displaced by patented units, designed to give high efficiency with low consumption of gas. To stimulate and encourage the use of these new units, the companies making them entered into a new line of business, that of contracting for gas street lighting.

The extent to which gas is now used for street lighting in the United States can be judged from the fact that there are approximately 250,000 gas units maintained under contract with municipalities. Each of these lamps, from the gas companies' standpoint, is a desirable consumer of a predetermined amount of gas per year, and largely during the "off peak" periods. The gas is automatically controlled to definite hourly rate, and the lighting and extinguishing are fixed by a schedule of approximately 4,000 hours per year. The gas company receives for gas used for this contract street lighting, in most instances, the rate that applies to its small consumers, and is not involved in any contracting relation with the municipality, and assumes no responsibility other than to supply gas to the lamps.

The street lighting situation to-day is mainly done by electric arc lamps and 60-candle power gas lamps, although the extension of electric conduits throughout the residential districts of our larger cities may make the tungsten lamp a serious competitor.

The maintenance charge for gas street lamps has been steadily reduced, by improved methods of operation and economic devices, and any further material reduction must be in the cost of gas.

The efficiency of the incandescent mantle is established, and has not been materially increased within recent years, although artificial silk mantles are stronger and possess the desired quality of maintaining their candle power. On the other hand, improvements are being made in electric filament lamps, and a new lamp having an efficiency of $\frac{1}{10}$ of a watt per candle may be available in the near future.

To successfully compete with these improvements it will be necessary to materially increase the efficiency of present gas lighting units, and the only way this can be obtained is by raising the pressure of gas and getting an efficiency more than twice that now obtained from low pressure units.

In the efforts to encourage the use of higher candle power, low pressure units for street lighting, a fixture bearing 2 inverted mantles was designed, which, on a consumption of 5½ cubic feet per hour, gave 150 candle power. The increased yearly consumption of this new unit held back its advancement most seriously, although some cities have seen the advantage of using it, and have thereby materially raised the efficiency of the street lighting at an increased cost not much above the actual cost of the additional gas used. It can be safely asserted:

First.—That gas street lighting has increased since the introduction of the incandescent mantle and is still increasing.

Second.—That electric companies are making every effort to extend their street lighting, by keeping prices for current low.

Third.—That gas companies, if they are to be active competitors for high candle power street lighting, must make lower prices for large consumption, and possibly in the near future carry higher pressures.

There is considerable difference of opinion as to how municipal street lighting should be handled, whether by a special lighting company, or by the gas company dealing directly with the municipality. The point cited in favor of a street lighting company handling this business, is that the gas company is not involved politically with the city in a way that might injure its general business.

Some of the Committee think that if gas companies directly dealt with municipalities they would not endanger their general business in any way. That it need not be affected to any marked extent is proved by the fact that electric companies successfully handle street lighting direct.

Commercial Tests of Gas Engines.

[From a paper read by Mr. W. A. Tookey before the Institution of Mechanical Engineers, London, England.]

An extensive series of tests was undertaken by the author on behalf of the Gas Light and Coke Company, and the South Metropolitan Gas Company, to note the performances of the engines in their condition "as found," and to improve such performances where possible. The two companies realized that many of the thousands of engines used by their consumers were expected to work year in and year out with the very minimum of attention beyond starting, stopping, and lubricating; and that it was to their interests to insure the utmost work was obtained from the least volume of gas.

The number of engines inspected was 763. A considerable proportion were found to be well looked after, and maintained in such good order that very little improvement was possible. Some, however, had been so neglected that no improvement could be effected without extensive overhauling. It was found possible to improve the working of 66 per cent. of all the engines tested, merely by adjusting the gas or air regulation or by correcting the ignition timing and valve setting. A greater proportion could have been improved had new parts been fitted, and attention given to matters which would involve stoppage for periods varying from a few hours to days. In all cases where renewals or overhauling appeared imperative, the user was recommended to call in the makers or expert gas engine repairers. The average improvement as regards increase of power per impulse was 27 per cent. For example, an engine found to be giving a mean pressure of (say) 60 pounds per square inch would be left giving 76 pounds with the same, or even a decreased, gas consumption, under the same load and speed. The average reduction in gas consumption was 13.3 per cent.

It was essential that tests should be made without stopping the work of the factory, and that the adjustments made would improve the working—not so much under "light" or "maximum" loads, as average output. Following a preliminary inspection at which were noted the size, type, and make of engine, arrangements were made to fit up the indicating gear and check over the valve settings during the midday meal hour; also noting whether the meter index remained stationary while the gas bag was kept fully distended and with the ignition tube burner turned off.

The engine was then started and after a trial card had been taken and examined, other diagrams were obtained. The impulses per minute and the number of revolutions were counted, and the gas consumption per minute noted with the engine running without any load except the main driving belt running on the loose pulley. This trial was known as "light, as found." Putting on the shop load a similar series of observations were taken and noted as "load, as found." Diagrams referring to the latter were then worked out on the spot, and calculations made to note the mean pressure obtained with respect to the mixture strength.

From the previous checking of the valve settings and the information afforded by the "load, as found" cards, together with an examination of a diagram taken with a light spring, it was possible to decide what adjustments should be made. Diagrams were then taken under different conditions, until it was determined exactly how to achieve the desired result. Occasionally several hours were spent before a satisfactory result could be obtained.

The inspection was concluded with a final consumption test under normal shop load; and the comparisons then made of the "as found" and "as left" results showed what improvement had been effected. A record sheet was then made out, and from this a report to the gas company for the information of the consumer. The report was not so detailed as the test sheet, only giving the comparative "as

found" and "as left" figures, with a brief statement of the condition of the engine, with suggestions as to repairs, etc. These particulars, for a 24-inch by 30-inch engine, are detailed in the following table:

TABLE I.	Load, as Found.	Load, as Left.
Impulses per minute	67.50	64.70
Cubic feet of gas per minute	46.20	43.60
Impulses per cubic foot	1.46	1.48
Charge volume per cubic foot	12.32	12.49
Mixture strength, B.T.U.'s per cubic foot	40.55	40.00
Mean pressure, pounds per square inch	87.50	95.50
Factor: $\frac{\text{mean pressure}}{\text{mixture strength}}$	2.158	2.388
Indicated horse power	202.49	211.80
Cubic feet of gas per I H.P	13.70	12.36

Observations.—Diagrams "load, as found" showed late firing, which was corrected by advancing the ignition of both magnetos—one by one notch and the other by two notches. Anti-pulsator valves in both gas-bags were not working freely, and diaphragms were flabby. The exhaust valve was opening early and closing very late. Instructions were left with attendant to correct this.

My experience with internal combustion engines has indicated that, while the strength of the mixture in combustion is rarely considered in authoritative trials, yet this is one of the most important matters to be determined. In all these tests the mixture strength of the charges taken in were computed in terms of total cylinder contents—that is to say, gas, air and residuals—and then compared with the mean pressure (positive loop) calculated from indicator diagrams. The factor, $\frac{\text{mean pressure}}{\text{mixture strength}}$, thus obtained has been invaluable in deciding what to do to obtain better performance. In order to express the mixture strength in terms of total cylinder volume, it is necessary to know the clearance volume as well as the piston displacement. The latter can be calculated from the cylinder dimensions; but the former, in commercial tests, cannot be definitely measured. A close approximation can nevertheless be obtained by observing the compression pressure attained, and by noting the volumetric efficiency of the engine.

Fig. 1 shows a light spring card from the engine referred to in Table I. It will be seen that the point along the atmospheric line at which the compression curve crosses is alone taken into account; for at this point the whole of the cylinder is filled with a mixture of gas, air, and residuals at atmospheric pressure. In this engine the piston displacement was 7.85 cubic feet, and the effective piston displacement was 7.85 × 0.876 (volumetric efficiency) = 6.88 cubic feet. The compression pressure attained was 120 pounds above atmosphere, or 135 pounds absolute. Taking the atmospheric pressure as 15 pounds, the compression pressure ratio was 9; and, assuming the exponent of the compression curve to be 1.30, the total cylinder volume must have been 5.4 times that of the compression volume. Therefore, it can be computed that the effective piston displacement, 6.88 divided by 5.4 − 1, or 4.4, will give the content of the clearance space fairly close. Thus the figure 1.56 cubic feet is arrived at for the clearance space, and that of 8.44 cubic feet for the effective cylinder volume.

The number of impulses and the gas registered by the meter will give the number of impulses per cubic foot of gas. In table I, for the "load as found" it is 1.46. Therefore 1.46 multiplied by the effective cylinder volume, 8.44, gives the number of cubic feet of stuff with which 1 cubic foot of gas is mixed—viz., 12.32. If then the calorific value of the gas be 500 B.T.U., the value of a cubic foot of stuff in the effective cylinder volume is 500 ÷ 12.32 = 40.55 B.T.U. The diagram Fig. 2 shows that, upon ignition, the strength of mixture gave a mean pressure of 87.5 pounds per square inch, or 2.158 pounds for each B.T.U. per cubic foot of mixture. To one who is the habit of checking the performances of internal-combustion engines in this way, the value obtained for the factor $\frac{\text{mean pressure}}{\text{mixture strength}}$ at once indicates that the engine was doing well in respect of economy, and that usually no betterment can be expected under ordinary working conditions.

From the diagram, however, it will be seen that the ignition was somewhat late. An attempt was made to correct this by accelerating the low-tension spark from both magnetos, each lever being moved one notch forward. The result is shown in Fig. 3. While improved, the ignition was still somewhat late, and the magneto at the back end of the combustion chamber was further adjusted by moving the control lever one notch further. The diagram then obtained (Fig. 4) was satisfactory; the slight variations in successive cycles noticeable at the top of the card being attributable to the irregular movements of the anti-pulsator valves in the two gasbags.

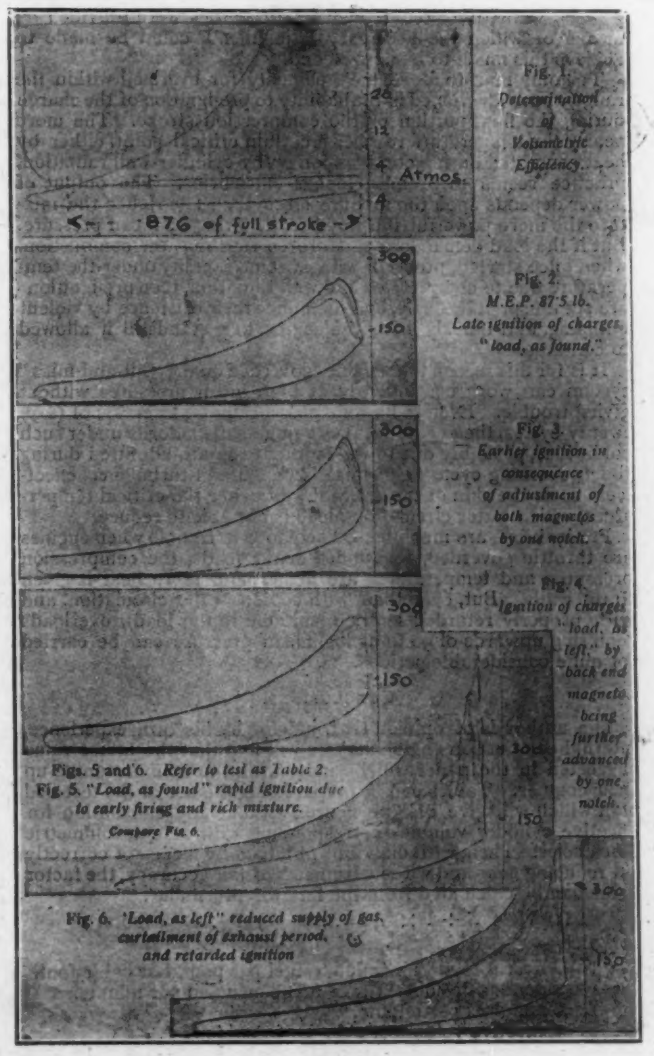


Fig. 1. Determination of Volumetric Efficiency.

Fig. 2. M.E.P. 87.5 lb. Late ignition of charges "load, as found."

Fig. 3. Earlier ignition in consequence of adjustment of both magnetos by one notch.

Fig. 4. Ignition of charges "load, as left," by back end magneto being further advanced by one notch.

Figs. 5 and 6. *Refer to test as Table 2.*
Fig. 5. "*Load, as found*" rapid ignition due to early firing and rich mixture. *Compare Fig. 6.*

Fig. 6. "*Load, as left*" reduced supply of gas, curtailment of exhaust period, and retarded ignition

The next step was to determine what effect these adjustments had upon the gas consumption. The "load, as left" count was therefore taken, and the factor found to be 2.388—a most satisfactory value.

The assumptions necessary for obtaining this factor in commercial tests preclude acceptance of the figures as absolutely accurate; but, as a standard of comparison for test-bed work and for general purposes, the factor will be found particularly useful. It shows very clearly whether any engine is or is not doing well, whether the mixture employed is too strong, and also what influence ignition-timing, prevailing skin temperature of the cylinder walls, and deliberate adjustments, have upon the performance.

Suggested Testing Regulations in the United States.—A Criticism.

[By JACQUES ABADY, in *Gas World.*]

The introduction to the circular of the U. S. Bureau of Standards, upon "Standard Regulations for Gas Supply," says: "The Bureau has constantly kept in mind the idea that any expense thrown upon a gas company by reason of rules which increase the cost of gas making or increase the labor or expense of distributing the gas or conducting the business falls upon the public ultimately. For, under a just regulation of the business by public service commissions or city councils, the price of gas must be high enough to permit a reasonable profit to the stockholders, and if any needless expense so caused does not actually force the price of gas up, it may prevent or retard a reduction which could otherwise be made * * * With this in view the Bureau has recommended requirements lower in some respects than prevails in some cities and higher than prevail it others; not with the idea merely of striking an average, but rather of specifying the conditions most favorable for maximum economy and efficiency."

(*Continued on page* 106.)

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CHARLES H. WADELTON, Secretary and Manager.

THOMAS J. CUNNINGHAM, SANFORD K. CAMPBELL, } Editors.

NEW YORK, MONDAY, FEBRUARY 16, 1914.

[Official Notice.]

Forty-fourth Meeting, New England Association of Gas Engineers.

New England Association of Gas Engineers,
Office of the Secretary,
East Boston, Mass., Feb. 5, 1914.

The Forty-Fourth Annual Meeting of the New England Association of Gas Engineers, will be held at Young's Hotel, Boston, on Wednesday and Thursday, February 18 and 19, 1914. The meeting will be called to order *promptly* at 10 A.M. The following are to be presented:

"Notes on Vertical Settings in English Works," by C. A. Learned.

Lecture on "Ventilation," Wednesday, P.M., by Prof. S. H. Woodbridge, M. I. T.

"Chemical and Physical Properties of Lubricants," by Dr. J. F. Wing.

"Some Experience in Automobile Operation," by G. A. Smith, Jr.

Motion Pictures. "Ore, to Finished Pipe," Thursday, A.M., by F. N. Speller.

"Data on the Influence of Copper on the Corrosion of Iron and Steel," by E. R. Hamilton.

"Intensifying Output," by F. C. Crafts.

Questions for the "Box" should be sent to the Secretary as early as possible. Members will dine together Wednesday evening. Members are requested to notify the Secretary of changes in address. Please be prompt in getti g to the sessions, and don't forget to bring your copies of the papers. All friends of the Association are cordially invited to attend the meeting. N. W. Gifford, Sec.

[Official Notice.]

Annual Meeting, Indiana Gas Association.

Indiana Gas Association,
Office of the Secretary,
Indianapolis, Ind., January 24, 1914.

The annual meeting of the Indiana Gas Association will be held at Terre Haute, Ind., Wednesday and Thursday, March 11th and 12th, 1914, the sessions each day, beginning at 10 A.M. The headquarters will be the Terre Haute House, where 70 rooms have been reserved for the convention delegates. It is advisable that early application be made for reservations. If the available rooms are all spoken for, reservations may be made at the Filbeck, Plaza, or Great Northern Hotels. The programme includes these numbers:

Address by a Member of the Public Service Commission of Indiana.

President's Address, by A. S. Cooke, Terre Haute.

"Employers' Compensation," by O. O. Thwing, Chief Engineer, Western Gas Construction Co., Fort Wayne.

"Light and Illumination" (demonstrated), by R. F. Pierce, Manager, Illuminating Engineering Laboratories, Welsbach Company.

"Calorific Value, as Expressing the True Quality of Gas and Conditions Governing Its Supply," by J. B. Klumpp, Inspecting Engineer, United Gas Improvement Company.

"Yields of Gas from Coal as Related to British Thermal Units," by J. C. Silverthorn, Superintendent, Evansville (Ind.) Public Service Company.

The Association will consider the question of revising its Constitution and By-laws, so as to provide that any member whose dues shall remain unpaid for a term of 1 year (instead of 3 years, as at present provided), may, at the discretion of the Executive Committee, be dropped from the roll of membership. Philmer Eves, Secy.

[Official Notice.]

Time and Place, Annual Meeting, Wisconsin Gas Association.

Wisconsin Gas Association,
Office of the Treas.-Sec.,
Milwaukee, Wis., Jan, 30, 1914.

To the Members, Wisconsin Gas Association: The Executive Committee of this Association, to whom was referred the matter of time-and-place for holding the next annual convention, decided on Milwaukee as the place, and May 13 and 14 as the date.

Yours truly, Henry Harman, Secy.

[Official Notice.]

Tenth Meeting, Illinois Gas Association.

Illinois Gas Association,
Office of the Secretary,
2501 Salt St., Chicago, Feb. 10, 1914.

The Tenth Annual Convention of the Illinois Gas Association will be held in Chicago, March 18th and 19th, 1914, at La Salle Hotel. The following papers are being prepared to be read and discussed at the meetings:

"The Welding and Cutting of Metals in the Gas Industry," by H. P. Harding.

"Trenching Machines Versus Hand Labor," by C. B. Strohn.

"Utilization of Gas Appliances in the Wholesale Preparation of Food," by I. A. Hoy.

"Street Lighting by Gas," by F. V. Westermaier.

"Applications of Centrifugal Machinery for Boosting and Exhausting Gas," by E. A. Hultz.

"Human Engineering Applied to Gas Company Employees," by T. V. Purcell.

"The Process of Manufacture of Gas Stoves and Ranges, from the Raw Materials to the Finished Products."

"The Process of Manufacture of Pipe, from the Raw Materials to the Finished Products."

Copies of the papers will be mailed to the members about March 10th, so that all can become familiar with them and thereby insure lively discussions, which bring out the best points.

The Entertainment Committee announces the usual "Stag Banquet," for the evening of March 18th, at La Salle Hotel, and promises the best of everything—menu, speakers and vaudeville. The Committee has decided to not include the ladies. This is in accordance with the custom at the Association's Banquets.

Horace H. Clark, Secy.

OBITUARY NOTE--MR. CHARLES F. PRICHARD.

The Journal, for January 26th last, published brief mention of the death of Mr. Charles F. Prichard, whose final summons was served, at his home in Lynn, Mass., the evening of January 21st. In accordance with our practice in these respects we have endeavored to frame a connected story of his useful career in a profession that eventually crowned him with every honor within its bestowal.

Charles F. Prichard was born in Marblehead, Mass., June 10, 1856, from a parentage who deprived themselves of much that their son might gain the early tuition needed to fit him for the higher ways of gaining a livelihood. Frail in body, that body was animated by a wealth of brain and a stoutness of heart that succeefully carried him over the early rough spots. His first tuition was gained in the Marblehead public schools, and on graduating therefrom he entered the Massachusetts Institute of Technology, from which justly renowned seat of learning he took leave (Class of 1876) with the title of B. S. His first active business connection was in the clerical division of the Worcester (Mass.) Gas Light Company, but the clerking connection was rather nominal than real, since every spare moment he could find was given over to a study of manufacturing conditions. In this latter respect he had the benefit of the tutelage of that prince of gas men, the late J. H. Rollins, whose memory still lovably lingers in the minds of all who had the good fortune to know him. About 1878 he accepted the position of Superintendent of the Pontiac (Mich.) Gas Company, and some time later (about 1881) he returned east to assume the management of the Dedham and Hyde Park (Mass.) Gas Company, then a link in the chain of small gas companies controlled by the late W. Eliot Fette. During this period it will be remembered that the gas world was all agog over the marvellous happenings that were constantly being manifested in the field of electrical currents respecting illumination and power applications. Early in 1882 he received the important appointment of Superintendent of the Lynn (Mass.) Gas Company, succeeding the late E. H. Yorke, who, if we mistake not, was that year named as works' superintendent, the Eastport (Me.) Gas Light Company. At last in his proper sphere his rapidly expanding talents as an exgineer had

free play for development. In the Lynn situation, too, he was singularly fortunate in making the close acquaintanceship of that most erudite of electricians, and king of men, Dr. Elihu Thomson. This advisory connection enabled Mr. Prichard to figure as a pioneer in the gas business, in respect of carrying on the conjoint business of gas and electric lighting. And the immediate result was the rearranging of the corporate powers of the Company, under the title of the Lynn Gas and Electric Company.

In 1901 Mr. Prichard was appointed General Manager of the Company and in 1908 he was chosen Vice-President and General Manager of the corporation, in which dual position death found him. The story of his connection with the Lynn Company is almost novel. From a corporation, the interior of which was shaken with dissension, and serving a territory the inhabitants of which were often in outspoken rebellion against its management, he gradually—in fact, speedily—brought about harmony at home and peace abroad. In fact, the finest monument to his memory is the splendid plants that to-day serve the people of Lynn with artificial lighting currents. Besides the Lynn connection Mr. Prichard was actively concerned in these Massachusetts properties: The Salem, Brockton and Fall River Gas Companies, and electric lighting corporations of Beverly and Gloucester. Other large business enterprises with which he was intimately associated were: The Essex Trust Company and the Lynn Storage Warehouse Company. He was a great believer in and upholder of the benefit of association work in and to the lighting industry. He gave much of his time and thought along these lines, and was a close attendant at the meetings of the various gas engineering bodies. Nor were his associates slow to recognize his worth to them. He was the Fourth President of the American Gas Institute (1908-09), Tenth President (1890-91) of the New England Association of Gas Engineers, and on the declination of Mr. C. H. Nettleton to longer serve the Association as Secretary, he took up those duties, and continued as such (1892-1899) until he was obliged to give over the work, and Mr. Gifford was chosen to succeed him—was No. 17, non-Resident list, the Society of Gas Lighting; was a Charter Member the Guild of Gas Managers. To all of these he contributed wisely and well, as the records of these bodies show, both in the preparing of papers, the sharing in discussions, and his yeoman service on committees. He was a student in many ways, a successful delver along inventive lines, a fluent, forceful writer—we violate no confidence now in saying that he it was who who wrote the matters that appeared in the JOURNAL from time to time under the *nom de plume* of "Eastern Observer"—and altogether a brainy man, whose judgments were ever founded on fact. And another marked thing about his always splendid personality was the time which he spent in imparting information to any youngster who approached him.

The writer had the pleasure of a personal acquaintance with him that covered a third of a century, and had the satisfaction of watching a development that, as it took on ever-increasing proportion, never caused his personality to ever lose a jot of its charm. Naturally he was prominent in the religious, mercantile and social matters of his place and time. He was a professing member of the First Universalist Church, was on the rolls of the Tedesco and Corinthian Yacht Clubs, and of the Oxford Club, and was prominent in the accomplishings of the Chamber of Commerce. And in all of these he was an active, practising member.

Never physically robust, and a sufferer from cardiac trouble for several years, during his attendance in New York at a special meeting of the Committee on Revising Constitution, American Gas Institute (March, 1913), he was stricken with acute indigestion, which confined him to his home for quite 2 months. His last attendance was at the Richmond meeting of the Institute last October, and there he suffered a further setback. His condition towards the close of 1913 was often critical, but he would not submit to the inroads of disease; in fact, early the week of his demise he visited Boston to consult with his physician.

He is survived by his wife, Florence E. (nee Grier) Prichard, a daughter (Mrs. Francis W. Rice), a son, Mr. Charles Rollins Prichard, and a brother, Mr. Ezra Prichard, of Marblehead. The funeral services were held in his home, 40 Nahant street, Lynn, the afternoon of January 24th, Reverend Frederic W. Perkins officiating. Amongst those in attendance were the Massachusetts Board of Gas and Electric Light Commissioners, Mr. Walter R. Addicks, Vice-President, Consolidated Gas Company, New York; Mr. Alfred E. Forstall, New York; and Mr. D. J. Collins, of Philadelphia.

Of course, special representatives were present from the New England Association of Gas Engineers, the Guild of Gas Managers, the Society of Gas Lighting and the American Gas Institute. The floral tributes were many and beautiful, and all the flags on the public and private buildings of Lynn were at half-mast, as was also the flag over the building of the Engineers' Club, of Boston, of which organization, it should earlier have been written, Mr. Prichard was a charter member. Useful to his fellows when his time was of theirs, beneficial for many a period of years to come will be the force of his admirable career.

BRIEFLY TOLD.

FORESIGHT IN RESPECT OF DEMANDS THAT MINERS MAY MAKE.—It is common comment in our exchanges that have to do with the coal trade that large consumers of coal, especially in the Middle West, are forearming themselves through arranging for the results of the looked-for biennial strike in April in and around the bituminous coal producing districts. Thousands of tons of coal are heaped alongside railroads, the coal pits clearances are brimming, and storage places filled to the limit, all mute but positive attestings to the preparedness of large utilities for the periodic contention of the miners—no, of the pernicious activities of the "strike leaders." A distinctive appearing of this year's struggle is in the knowledge that the pit men are laboring overtime to get out enough coal to help out railroads, industrial plants, and the like, through the possible length of the interregnum. Should a strike be ordered, it will mean a severe test as to the holding out of the Nation's coal heap as opposed to the financial strength of the malcontents. In any event a goodly economy can be gained through storing coal, as compared to that which may have to be paid for fuel bought during the period of contention, in that the loss in fuel worth of coal chargeable to exposure will be largely nominal in comparison to that which would surely be lost were the utility not armed for the struggle. It is considered that the miners will likely ask an increase of 5 cents per ton, run-of-mine coals, together with a 10 per cent. advance in the rate paid for outside labor of all sorts.

MR. JACQUES ABADY AS A CRITIC.—Elsewhere in this issue will be found the main points in a criticism at the thought of Mr. Jacques Abady, whose comments have to do with circular No. 32, U. S. Bureau of Standards. We are moved to make this printing in the knowledge that Director Stratton and associates in the Bureau have been anxious to have these matters critically examined and commented upon. While recognizing that some of the points raised in this criticism are worthy of careful consideration, we nevertheless depreciate the clothing of remarks on such important questions in language that, to say the least, is in some places undignified and apparently frivolous in tone, even if not so intended.

CURRENT MENTION.—

MR. B. C. ADAMS has resigned the Presidency of the Iowa District Gas Association, he having removed permanently from the territory covered by the Association. Mr. H. C. Blackwell has been appointed to fill the vacancy.

"P. B. R.," writing from Little Rock, Ark., under date of the 7th inst., incloses this mention: "Judgments of $4,500 and $2,000 respectively, in the cases of Joseph Miller and Patrick Gallagher, awarded recently against the Arkansas National Gas Company in the Saline County Circuit Court, have been reversed in the Arkansas Supreme Court, The opinion, written by Associate Justice Carroll D. Wood, sets forth that the Court erred in overlooking a contention of the defendant Company, that the accident, which resulted in the serious injury of the men, who were repairing a pipe line leak, was due to negligence on the part of the contracting firm laying the line and not to negligence on the part of the Gas Company's inspectors, who had already found the leak and had ordered the contracting company to repair it.

MESSRS. MEIKLEHAM & DINSMORE, of New York, announce the opening of an office in Pittsburgh, Pa., under the direction of Mr. F. S. Carmack, with Messrs. A. S. Everest, H. L. McVicker, M. R. Crawford and David Stewart as associates. The same firm recently appointed Mr. N. B. Hall, as representative for Western New York, with offices in 72 Pearl street, New York.

THE Gas Machinery Company, of Cleveland, O., recently completed 6 arches for inclined benches of 6's with sectional silica retorts and settings, waste heat boiler, retort house and coal and coke handling machinery in the plant of the Jacksonville (Fla.) Gas Company. The results obtained with it have been such that the Jacksonville folks have now placed a contract with the Gas Machinery Company for practically a duplicate of the first installation. Erection will be gone on with as soon as the foundations can be made ready.

"H. F.," writing from Bessemer, Ala., under date of last Monday, incloses this mention: "The Bessemer Gas Company recently gave to, and installed for, the 'Pastors' Helpers' a cabinet gas range, which was set up in the kitchen section of the basement of a new Methodist Church, erected at a cost of $40,000. The range was said to be the one thing requisite to complete the furnishing of the beautiful edifice, and the ladies particularly were grateful for the gift. A ¾ inch, high pressure service line was run to the building across the edge of a 30 foot kitchen garden. The day following the laying of the service the Presiding Elder of the District filed suit against the Gas Company for $500 damages incurred through the disturbing of the soil of the 'garden,' which, at the time of the placing, was overrun in a rank weed-growth. The gentleman (?) noted above lives next the church, in fact, upon the church ground, is about 6 feet 4 inches in height and weighs about 250 pounds; but, because of this action, he is now considered the smallest man in this section. Further, his action was condemned by rising vote of the congregation taken during services one Sunday evening. However, his suit will not materialize, the Gas Company has gained splendid advertising from the incident, and it is predicted that, at the end of the Church Year, his activities as a pastor in this section will be at an end."

(*Continued from page* 103.)

The propriety of these platitudes is undeniable, and benevolent intention obvious in every unctuous syllable; but the discussion and suggested regulations which follow appear to me to furnish one more witness to the truth of the belief as to the direction in which a pavement of good intentions is commonly supposed to lead.

It is stated earlier in the preface that "In the preparation of the recommendations on the various phases of this subject the co-operation of many engineers and inspectors has been sought, and, in general, very freely given." This willing co-operation of many cooks, perhaps, may furnish a clue as to why "The Circular" is such an entirely unsatisfactory production—although it bristles with good intentions, undoubted honesty of purpose, and sincerity of desire to make the crooked places of American gas testing straight. With this candid admission, it seems perfectly proper to make the equally candid submission (which I shall endeavor to demonstrate), that it has failed lamentably in its avowed and evident object.

The following brief statement summerizes the proposals or rather the suggested rules for adoption by a city; those suggested for adoption by a State are similar, but carry no penalties. The various details of and differences between the two will be discussed fully.

1. A cubic foot of gas for the purpose of testing shall be the amount of gas which occupies the volume of one cubic foot, not corrected to 60° and 30″, but corrected to 60° and x″, x being the average atmospheric presure of the city. *The cubic foot thus becomes an elastic measure.*

2. *Heat Value.*—Monthly average of total heating value of x B. T. U. per cubic foot; no daily average total heating value to be less than y B. T. U. The equivalent heating value per cubic foot measured at 30″ pressure to be stated.

No less than two daily tests shall determine daily average.

No less than twenty daily averages shall determine monthly average.

3. *Candle Power.*—Monthly average by flat-flame burner of not less than x candles, yielded by the combustion at rate of 5 cubic feet per hour (corrected as defined in par. 1).

To be understood and agreed that this candle power is equivalent to a gas of, approximately, y candles when measured and burned at atmospheric presure of 30″.

If flame standard of light, the value assigned as the candle power when burner is at atmospheric pressure of the city and in air containing $\frac{4}{10}$ per cent. by volume of water vapor shall be used.

If electric standard is used, correction of the measured candle power shall be made to a humidity of $\frac{4}{10}$ per cent. by volume of water vapor in the air, "which is taken as the standard condition of humidity for photometry."

4. *Impurities.*—No H_2S; 1 minute test, at rate of 5 feet per hour not impinging directly on moist test paper with 6½ per cent. lead acetate. 30 grains sulphur per 100 cubic feet. 5 grains ammonia per 100 cubic feet.

If excess; average with following day and average quantity for week.

5. *Pressure.*—Area to be divided into district by company, who shall fix normal pressure—never vary by more than 2 inches above or below. Provided that maximum on any day shall never exceed twice minimum the same day and at same place.

The place is the outlet of company's service to any consumer.

If defect in pressure, then company shall correct within three months, but if defect reported in winter, then longer time is allowed on account of hardness of ground through frost.

6. *Meters.*—Every meter to be tested by company and to be within 1 per cent.

20 per cent. of meters at present in use to be taken down and tested annually.

Elaborate provisions for testing on complaint.

7. *Complaints.*—On complaint of consumer or inspector, a company may be required to promptly make "all such changes, alterations or additions to its methods or apparatus and equipment as may be necessary in order that the quality and pressure of the gas shall be such as required by provisions of this ordinance."

8. *Penalties* varing from $5 to $1,000, according to defect and annual make of company.

I now ask the reader to direct his attention to each of the items in detail, for in discussing them I propose to refer to the general arguments and references scattered about the volume under review.

1. The elastic cubic foot. It seems to me that this extraordinary proposal arises from lack of practical knowledge with respect to the manufacture and sale of gas. The more I ponder the more I have doubted whether one is intended to take the suggestion seriously, coming, as it does, from a country which justly prides itself on being practical.

Not only does it obviously introduce chaos, but it benefits no one. It does no good to the consumers; it neither adds to nor takes away from the gas revenue by one penny; and, in the way it is applied to testing, it is not even accurate or scientifically correct.

It appears to be based upon the suggestions put forward in a paper entitled, "The Legal Specifications for Illuminating Gas," presented to the American Gas Institute in 1912. The general argument is that, despite the fact that the average altitude is 500 feet, and the pressure 29 35 inches, yet in some cities the mean atmospheric pressure is not 30 inches, because the altitude of such cities is still higher, and that, therefore, as the altitude is higher, the volume of gas (of the density assignable to 30 inches pressure) contained in a cubic foot is proportionately less. It is, therefore, urged that if a gas upon test (reduced to standard condition of 60° and 30 inches) shows a calorific value of 600 B.T.U. per cubic foot, the consumer is being deceived, because each cubic foot he gets does not contain 600 B.T.U. Again, it is urged that there is a similar difference in the candle power, and the only way for a company to avoid being charged "With delivering short measure, as might be done when the real and rated values are found not to be the same," is to use the elastic cubic foot when obtaining photometrical and calorific results.

The arguments which run through pages of "The Circular" are many and ingenious, and it is even suggested that, for every 1,200 feet increase in altitude, a testing ordinance should call for an extra 25 B.T.U. All the arguments seem to me to have these characteristics:

(*a*) They are based upon a complete misconception of the purpose of testing regulations;

(*b*) They are unpractical, and without sense of proportion.

Dealing with (*a*), surely the object of a test is to merely establish a basis of quality of supply in relation to price as between the company operating the monopoly and the local authority representing the public. It is not, and cannot possibly be, the basis of a contract between the company and the consumer; a company's engineer does not say to a consumer, "I will supply you with 600 B.T.U. for 1 cent." He says, "I will supply you with so many cubic feet of gas for $1;" and if the consumer asks, "What gas?" he is naturally told, "Gas of the quality prescribed by the city and tested by its appointed officials."

Even if a cubic foot in one city contains gas of less density than a cubic foot in another city, where is the hardship to one consumer as compared with the other? Any idiosyncrasy in atmospheric pressure is going to affect the cost of manufacture just exactly in proportion to its effect on gas density; and to say that by using a cubic foot, which is one thing in Denver and another thing in Chicago, you are going to advance the consumers' interests in any way seems to me too absurd, even though, be it remarked, the Denver man's gas is called 700 B.T.U. gas (but is really 600 B.T.U.) and the Chicago man's gas is both called and actually is 600 B.T.U.

To introduce an elastic cubic foot does not eliminate correction of gas volume (as is customary for works manufacturing and leakage estimation) one little bit, nor does it get over any idiosyncrasies which must arise through changes of temperature. And what is to be done to counteract the effect of using gas at a high level due to the altitude of a building? Is Mrs. Smith, who toasts her toes over a gas fire on the 48th story of a skyscraper, to pay less for her gas than Mrs. de Smythe, who performs a similar operation in a ground floor suite? No; the underlying misconception runs right through all the arguments, and I should imagine has been by now pointed out by engineers in America.

What makes the matter more ludicrous is that the Bureau, very properly, sets out a long memorandum on the question of price of gas, from which one gathers that the less gas costs "The cheaper the price it can be sold," and other statements of (I should have thought) a similarly obvious nature. Indeed, the Bureau goes so far as to set up different figures of hypothetical costs of manufacture, which are arrived at and dealt with in a manner which shows a sublime disregard of Alexander Pope's excellent advice.

(*b*) Referring briefly to my allegation that the suggestion is unpractical and without sense of proportion, it seems to be imagined that, if gas be supplied which tests at 600 B.T.U., or 16 candles flat flame (in the sense we understand "test"), the consumer should get 600 B.T.U. per cubic foot, or 16 candles from 5 feet. This is quite

wrong. He never has done, never can, and as far as I can see never will. Unless he uses gas in a calorimeter he will not get "calorimeter" value, but always something less, which will depend upon him and not upon the gas. Unless he uses gas in a flat-flame burner he will not get the 16 candles, but generally something very much more, unless he chooses to use inefficient means of burning the gas to give light.

As an example of the absurdity of the idea of a company being charged with delivering short measure in candle power because the test volume is reduced to 30 inches instead of, say, 28 inches pressure, just imagine a charge of this nature being brought by, say, a German waiter in Detroit, shaving himself on a cold winter's morning, and catching sight (with his unoccupied eye) of the flat flame burner, who suddenly sees that the light is 15.8 candles, although his dime meter (accurate to 1 per cent. !) shows the rate of gas is 5 1 cubic feet, and although he saw in the previous day's "News" that the gas tests at 16.5 candles.

Then, again, as between one city and another, what does it profit Mrs. Jones (whose gas costs $1 for a 1,000 cubic feet of 625 B.T.U., and who is preparing a planked whitefish in Kalamazoo) to know that Mrs. Brown (who is busy in Salt Lake City cooking chops) gets 1,000 cubic feet of what is called 650 B.T.U. for $1? The gas is the same in both places, but is neither 625 nor 650 B.T.U. !

No; the consumer's grievance argument is, of course, quite beside the point, unpractical and non-existent.

I said that the application of the elastic cubic foot idea to testing was not even accurate or scientifically correct. The effect of (*inter alia*) atmospheric pressure upon flames has been investigated, and corrections on the basis of ascertained formula are applied to the 10 candle pentane lamp. The tests I am about to refer to are of gas burned at 5 cubic feet per hour, as measured through a meter, in a flat-flame burner, compared with the light of a 10 candle pentane lamp.

The Bureau admits that the gas flame and the 10 candle lamp are probably affected equally by changes in atmospheric pressure. But, having made this admission, it is then argued that where a pentane lamp is used in a city in which the altitude would cause its light to be, say, 9 candles, this would mean that the gas is rated 10 per cent higher than its actual value, unless the pentane lamp is called 9 candles.

Now, I suggest this is entirely wrong, for the causes which are depreciating the *flame value* of the 10 candle lamp are depreciating, to an absolutely equal extent, the *flame value* of the gas flame; and this depreciation is quite independent of the altitude influence upon the *quantity* of gas contained in the 5 cubic feet being consumed every hour by the flat-flame burner.

It is further argued that the consumer will be using his light at the altitude of the city, and therefore will not get the same light as he would if the city happened to be at another altitude. That is so; but the consumer does not use his gas under test conditions—he does not, for instance, correct the gas volume for temperature. Is he, then, under a grievance because, on a hot day, he gets less light (because his cubic foot does not contain so much "essential juice," due to temperature expansion), and because, in testing, gas volumes are reduced to 60°? No; the object of a test is to test gas quality in terms of a given volume of gas, measured under standard and universal conditions; and to tinker with those conditions by establishing artificial cubic feet and incorrect standard of light values seems to be entirely indefensible.

It is a proper thing to apply the correction to a 10 candle pentane lamp only when it is being used to compare some light which is not equally affected by atmospheric conditions, as for example, an electric lamp, but with a gas flame it is admitted by the Bureau of Standards, and generally assumed, that this *is* influenced just as is the standard.

In dealing with testing for candle power the circular lays down propositions which also seem to me to be unjustified, and which I, for one, am quite unable to follow. And, in any case, to try and prove a point by extreme instances or assumptions seems to me to tacitly admit the weakness of the case. As an example, consider the following, quoted from page 39:

If we assume that the luminous efficiency of the gas flame does not change with pressure, then we would have the following results from tests made in different ways. Given a gas of 15 actual candle power when burned at 30 inches pressure and normal humidity, the rated candle power would be 15 at sea level. The same gas burned under 25 inches pressure at the rate of 5 cubic feet per hour will have an actual candle power of 12.5 and a rated candle power (by current methods of calculation) of 17.3.

Now, first, what justification is there for the first assumption; secondly, what justification is there for saying the actual candle power at 25 inches pressure will be 12.5 candles? Thirdly, what current method of calculation transforms this 12.5 into 17.3 candles?

I suggest that the two assumptions are unjustifiable, the current method of calculation does not have the effect stated; and finally, the instance selected (25 inches as compared with 30 inches atmospheric pressure) is extreme.

Before leaving the question of an "elastic foot," I formally demur to the statement that "the actual candle power of the gas delivered should, if possible, be the basis of rating on the same basis that the actual heat delivered should be the basis of the heating value to be specified."

The reasons are, as already pointed out, that the actual candle power and heat value derived by the consumer depend upon the method of use, and that the central and sole object of gas inspection and testing is to establish a basis of value for the general contract between a monopoly undertaking and the local authority, which is involved in the possession of the monopoly.

There are one or two features in the suggestions with respect to calorific power testing which are very good. The first is that the standard is to be total heating value, and the second is that the penalizing point is not arrived at from a daily test but from the monthly average. In this respect the Bureau shows a quite commendable broad mind. Having said this, it now remains to criticise certain features, viz., the suggested heat units required, and the existence of a dual standard. For this reason the two standards, light and heat, are discussed together.

The objections have already been set out to the valuation of both of them in terms of the elastic foot, added to the additional conception (as I suggest, an erroneous one) of the function of correction factor applied to the 10 candle standard.

(*a*) Now it is suggested that the calorific power shall be 600 B.T.U. gross down to 550 B.T.U. gross—with a tendency to fix the higher value when carbureted water gas is used.

(*b*) It is stated that a requirement of 600 B.T.U. is reasonable and more economical than a lower value, and that if a company wish to dirtribute gas of less than 600 B.T.U. the burden of proof should rest on the company to show that local conditions are such as to permit better service with a lower heating value.

(*c*) It is stated that the intention of the Bureau in fixing a standard of lighting as well as of heating value is not to set up what is usually understood by a "double standard." The latter, it is said, involves a candle power requirement as difficult to meet as the heating value requirement, so that the gasmaker must watch and control both calorimetric and photometric values. The figures fixed for candle power are said to be so low as to avoid any trouble in this way. "The Circular" then goes on to say that:

> 600 B.T.U. c.w.g=18 candles flat-flame, and 16 candles should be required.
>
> 600 B.T.U. coal gas=12 to 15 flat-flame, and 12 candles should be required.

The city ordinance proposes penalties for heat and candle power. As already pointed out, the State regulation suggests no penalties at all.

(*d*) It is stated, and repeatedly assumed, that a drop of 10 per cent. in B.T.U. means a drop of 10 per cent. in value to the customer, and should be accompanied by a drop in price.

(*e*) It is admitted that there is a loss in distribution of high candle power or enriched gas *when candle power has been the object of manufacture*, that the candle power *losses may be as great as 30 per cent. under conditions by no means extreme*, but that a 600 *B.T.U. gas "made for heat units"* will lose very little in distribution.

All these propositions appear to me to be erroneous.

(*a*) and (*b*) To begin with, I suggest that the figure selected of 600 B.T.U. is much too high, but, if it is selected, then one can give as good a service of carbureted water gas of relatively lower heating value as one can with coal gas of a higher heating value, because the flame heat of carbureted water gas is relatively high. It will be seen from paragraph (*a*) that the reverse is assumed. I know not why.

(*c*) The idea of avoiding a dual standard is both good theory and modern practice, but is not borne out by the imposition of any candle power test, be it 2 or 20 candles. The assumption of the relationship

of calorific power and candle power at the figures stated is something quite new in my experience, and I should like to know how many gases of 600 B.T.U. total heat will show 18, or 15, or even 12 candles in a flat flame burner (not an argand) consuming 5 cubic feet of gas per hour. To show the fallacy of the consumption, as evidenced by English experience, I append average annual figures of the official tests of the gas of the 3 London companies, and it will be seen that not only is the figure of 12 candles not reached, but it is not even approached, and further, that there is no relationship between calorific and candle power. These figures do not depend upon isolated tests, and they deal with both coal gas and mixed coal gas and carbureted water gas.

	1912			1913		
	Gas Light and Coke Co.	South Metropolitan Gas Co	Commercial Gas Co.	Gas Light and Coke Co.	South Metropolitan Gas Co.	Commercial Gas Co.
No. 2 Met ...	14.52	15.49	14.89	14.4	15.51	14.61
Flat flame....	8.25	9.38	8.43	8.18	9.44	8.22
B.T.U. gross.	537.0	570.0	541.0	541.0	572.0	537.0

I think the figures disprove a great many of the assumptions made in "The Circular," and show at once the absurdity of the contention that a 12 to 16 candle power requirement and a calorific power requirement of 600 B.T.U. is not a double test, and is not an onerous test.

(*d*) The assumption that a 10 per cent. drop in calorific power means 10 per cent. loss to the consumer entirely overlooks all experience in the laboratory and in practice as to the inter-relationship of different calorific powers. It does not seem to have occurred to those responsible for "The Circular" that physical properties can vary in any other than a proportionate manner.

(e) I propose to leave the emphasized portions of this paragraph to speak for themselves.

A glance at the proposals for pressure tests show that the company must fix a normal pressure in each district, and never vary by more than 2 inches above or below it. Also that the maximum at any place on any day shall never exceed twice the minimum on the same day and at the same place.

The discussion on this matter of pressure is really the most delightfully inconsequent thing in the whole circular, and is based upon an entire misconception of what gas presure really is and what influence really is. It is obvious from the suggested regulation that there appears to prevail the impression that gas pressure is to a gas consumer what electrical pressure (voltage) is to an electricity consumer. The fact appears to have been lost sight of that there exists at the inlet of every consumer's service, and at every gas point, a transformer, simple in conception, perfect in its action, and capable of regulation to a nicety by any unskilled person. It is variously termed valve, cock, or tap, and the fact that its use is a necessary part of the use of gas renders all pressure regulations—bar a specification of minimum pressure—quite a superfluity. The effect of normals, maxima and variations not only are (I imagine) calculated to shorten the life of the most efficient distribution engineers, but they are positively harmful to all progress in the rapidly developing science of gas distribution.

There are many gems in the discussion which are worthy of permanent record. Such a one is the idea that the pressure at the outlet of the company's service to any consumer is the same thing as pressure in the main. It is stated, in fact, that unless a "particular service pipe is stopped or inadequate for the consumer supplied through it, the test represents the condition of the supply to the whole neighborhood."

Again, take this statement: "The surprising percentage of the complaints of 'poor gas' which, on investigation, resolve themselves into poor pressure, is sufficient reason for the use of gauges for complaint investigation." This carries with it the assumption that complaints of "poor gas" which, on investigation, turn out to be "poor pressure," have anything to do with main pressure. Surely no amount of gauges to test main pressure is going to influence choked internal service pipes, or consumers' fittings, which, practically, all complaints of "poor gas" resolve themselves into. Then, again, it is gravely stated that "in setting test gauges care must be exercised by the inspector, for leakage of gas resulting from his opening the service head may be serious. However, with careful work, no danger need be feared."

There is a proviso in the draft regulations themselves with respect to pressure which also strikes me as being humorous. If a deficiency of pressure is found, the company is given 3 months to remedy it, but if the deficiency is reported in winter they may be allowed a longer time, "*because frozen ground interferes with street operations.*" I don't for a moment dispute the truth of the emphasized paragraph, but I refuse to believe that a defect of main pressure necessitates breaking up the roads, except quite occasionally.

The Bureau of Standards deals at length with the effect of pressure upon apparatus, but, as I have said above, the whole case seems to be based on the misconception that gas pressure is equivalent to voltage.

It seems somewhat anomalous that there are no general regulations in force in America with respect to testing meters, and so accustomed are we to the idea of a Government-stamped measure, that no doubt readers will agree with me that the suggested test and stamping by a gas company of all meters is not a satisfactory idea, and a task which most gas companies would rather be without.

However, whoever tests and stamps meters, the requirement of an accuracy of 1 per cent. is not a practicable one, and if the Bureau will test some meters on successive days under differing conditions, the reason of my doubt will be made manifest.

There is a final matter to which reference should be made, namely, that on complaint of consumer or inspector it is recommended that the company may be required to make changes in or additions to its methods. I do not think many engineers with knowledge of the relative experience of those managing a gas works and those testing the gas would care about clothing the latter with power to dictate to the management upon matters appertaining thereto. It is but fair to say, however, that the Bureau of Standards makes the suggestion in a tentative way.

In conclusion, while expressing my regret at the necessity for the strong criticism levelled in places, I am sure it will be understood that what I am criticizing is "The Circular" as a document, quite impersonally and without in any way making any suggestions as to the capability, zeal or singleness of purpose of the officials responsible for the production of the "Standard Regulations for Manufactured Gas and Gas Service."

Inspection of Government Coal Purchases.

The inspection of coal purchased for the Government is conducted from the headquarters of the National Bureau of Mines in Washington, where the engineer in charge of the inspection is stationed.

The work done includes the collecting, analyzing, and testing of samples representing deliveries of coal purchased under Government contracts providing for purchase on a specification basis. Most of the coal used in power plants, public buildings, and naval stations is purchased under contracts that specify the ash and the moisture content, the heating value, the limits of volatile matter, and the sulphur content. The analyses determine whether the coal is up to the standards guaranteed by the contractor; and if not, the price to be paid is decreased in proportion to the lower value of the coal; or if the coal is of higher quality, the price is proportionately increased.

By following the instructions of the Bureau, and by observing every practicable precaution, samples fairly representing the coal delivered are insured. The gross samples taken are reduced by successive crushings, mixings, and partings to about three pounds, and sent by mail to the laboratory in Washington.

The purchases under specifications prepared by the Bureau aggregate approximately $4,500,000 per annum, and the additional fuel bought under the general advice of the Bureau aggregates some $3,000,000 more, making a total value not less than $7,500,000.

The benefits to the Government from this work have been both general and special. In the case of the Isthmian Canal Commission during the fiscal year 1910-1911, the money actually saved by the Government was nearly $75,000, and the real saving was probably several times that, because the method of purchase insured deliveries of a higher grade than would otherwise have been obtained. The saving for the Quartermaster Corps, War Department, amounted to $27,500 for the fiscal year 1912.

The benefit to the general public from this work is indicated by the fact that more than 50 cities, a number of States, and numerous private corporations and business concerns have followed the general plans adopted by the Government.

The analyses of coals from the different coal fields made in testing these coals for the Government, have been of great service to power engineers and to manufacturing industries enabling them to know in advance the character of the coals available. At the request of

the Navy Department, the mining and shipping facilities of mines from which purchase is proposed are examined by the engineers of the bureau, and samples from each mine are analyzed at the Pittsburgh laboratory Coal purchased under specification for naval vessels amounts in round numbers to 700,000 tons a year.

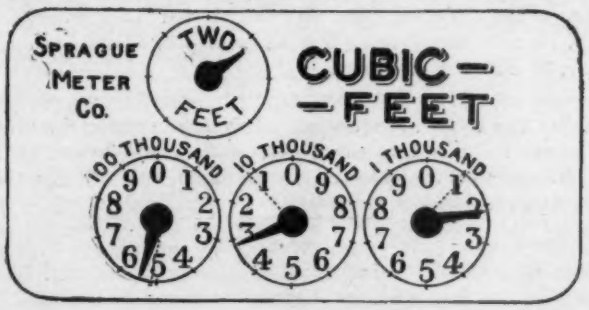
The steaming tests that have been conducted, and the advice of the bureau's engineers, result in further economies to the Government. For instance, by a change in the coal one Government boiler plant is spending between $4,000 and $5,000 a year less than formerly for fuel; another plant reduced its annual expense for fuel about $15,000.

Short Directions for Meter Reading.

[Communicated by Mr. W. P. Hutchinson.]

On page 58, your January 26th issue, we notice certain instructions for reading meters. We note further, you would be pleased to have anybody use your columns in offering suggestions. We are mailing you, under separate cover, an electrotype, which we have gotten out in two sizes, giving instructions on "How to Read a Gas Meter," suitable either for a card or for use on the backs of the bills. We would be pleased to mail these electrotypes without charge to any company that cares to use them. We have tried to condense this information in the smallest space possible, and in as thorough a way as we could. Mr. Hutchinson's address is, Sales Manager, The Sprague Meter Company, Bridgeport, Conn.

READ YOUR OWN METER



50000 + 3000 + 200 = 53200
Statement last month = 51100
Gas used since last reading 2100

The dial on the right hand (marked 1 thousand) indicates 100 feet from one figure to the next. The middle dial (marked 10 thousand) indicates 1000 feet, from one figure to the next. The dial on the left (marked 100 thousand) indicates 10000 feet from one figure to the next.

If the hand on the right dial is between the figures 2 and 3 the lesser of the two numbers is read, or 200 feet. If the hand on the middle dial is between 3 and 4, this dial reads 3000 feet. If the hand on the left hand dial is between 5 and 6, the reading of this dial is 50000 feet. The complete index as indicated on the three dials would read 53200. From this amount deduct last reading for this month's consumption, as per example above.

THE GAS COMPANY

New Methods and Appliances.

A Safety Car Hopper Wrench.—This safety wrench has been brought out for opening the hoppers on dump cars. When an ordinary wrench is used for this purpose the operator must be careful to get out of the way quickly, or he may be struck. The new wrench is placed on the square end of the hopper shaft, with the small handle of the reversing device, *A*, in the position shown in the cut. The wrench is then lifted until the pawl, *B*, which is held down by the finger, engages the ratchet, and then removes the pressure from the car dog. The dog is then released by lifting it with the finger while the wrench is held steady. While the car dog is up, the wrench is quickly lowered and the pawl *B* springs out, allowing the ratchet to revolve freely as the doors drops. In this operation the pawl is automatically thrown out of engagement with the ratchet at the instant the wrench is lowered, so it is practically impossible for the operator to be caught. If the door does not start promptly the handle is raised

and pressed down, with the safety pawl still out of engagement, forcing the door open. For closing the hopper the car dog is released and the handle of the reversing device, *A*, pushed into a downward position. This makes the wrench an ordinary ratchet one and enables the shaft to be revolved until the door is closed.

The wrench fits the 2 inch square M. C. B. spindle end, even though it be badly battered. Where cars are not equipped with standard spindle a bushing or special socket for smaller size ends can be had.

With this wrench it is possible for 1 man to open a hopper door in about half the time required by several men with an ordinary wrench, and there is practically no danger.

A New Type of Gasholder Without Columns.—A departure in the construction of columnless gasholders is the single-lift holder recently erected at the Westbury gasworks, England, under patents taken out by Mr. W. Blakeley. The shell is of the ordinary type, with crown framing, vertical stays and bottom carriages, but instead of crown carriages around the top of the holder, these are fixed around the curb of the tank with vertical channel guides on the outside of the holder shell. In other words, the carriages and channel guides change places from the positions occupied in column guided holders. These channel guides project sufficiently above the top of the holder to prevent the pulleys leaving the guides when the holder is down. The guide carriages are bolted to the tank wall, and the cheek plates of the carriages are set at an angle, to give additional strength against side strain. The carriage pulleys are covered to guard against ice or other obstructions, and a stiff bristle brush rubs in the channel as the holder rises and keeps it clear.

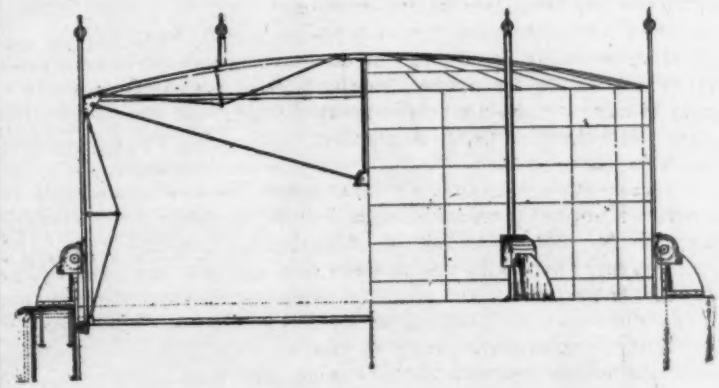


Fig. 1.

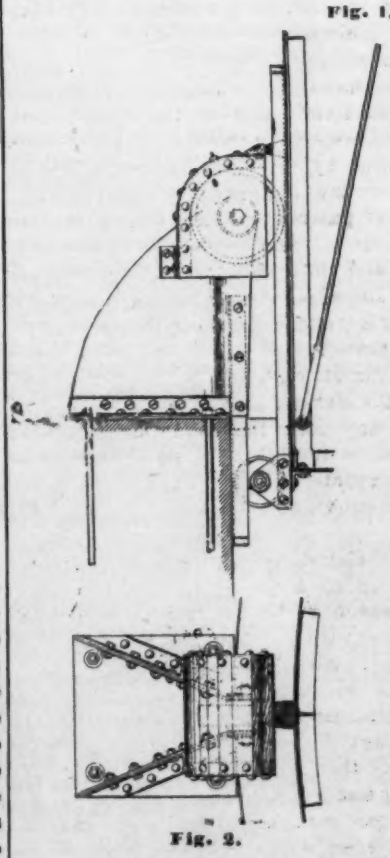


Fig. 2.

As will be seen in Fig. 1, the guiding of the holder is dependent upon the vertical and parallel guides of the holder and tank, the bottom carriages working in the tank channel guides, and the others running in the guides on the outside of the holder. It is, therefore, impossible for the holder to get

out of true or to fail to rise vertically, and resistance to rise and fall is comparatively small.

The bottom curb of the holder is a stronger angle than is usual in the case of a column-guided holder, so that the transmitted strain of wind pressures can be successfully withstood. The vertical tank channels are continued above the top of the tank, and form part of the stiffening to the tank carriages. The vertical stays inside the holder are fixed directly behind the outside guide channels, and, being trussed, are capable of resisting any bending movement caused by the pressure of the carriage pulleys against the channels.

This holder, the first of the type to be erected, is a single lift, but obviously the same principle can be adapted to telescopic holders. It was constructed under the supervision of Mr. N. H. Humphrys, of Salisbury, who is Engineer to the Westbury Gas Company.

UNIQUE POWER PLANT.—The Ford Motor Company has contracted for a gas engine-electric power plant that will be one of the largest in the country, and in many respects altogether unique. Four 6000-hp. Hamilton-Gray gas engines of novel design will drive the same number of Crocker-Wheeler direct-current generators, but one pair of cylinders will be operated by producer gas and the other by steam. The steam will be generated from the cooling water used in the jacket of the gas engine, further heated by the exhaust gases and by waste heat from the producer gas plant. This water will be used as feed water for the boiler which supplies the steam cylinders. A heavy flyweel will equalize the characteristics of the gas and steam driven elements of the engine. The engines are cross-compound with two cylinders in tandem on each side.

AN EXPANSION CALORIMETER.—Herr H. Junkers, of Aschen (Germany), has been granted patents on a new method for measuring heating values of fuels, solid, liquid or gaseous. The method consists in using a calorimetric vessel filled with a definite quantity of liquid, and allowing the hot gases given off during combustion to flow past surfaces which transmit all the heat of the gases to the liquid. The measurement of the heat, which when divided by the weight of fuel consumed, gives the heating value, is had by means of a device which measures the increase in volume of the liquid in consequence of the heating. In order that this increase in volume may bear a constant ratio to the amount of heat taken up by the liquid, use is made of a liquid that possesses a co-efficient of expansion which is independent of the temperature, and constant within the range of temperature observed. Unless this be the case, the increase in volume can only stand in a definite ratio to the heat absorbed, provided all parts of the liquid are at exactly the same temperature, and this would require a stirring device, kept in operation during the experiment. But if, notwithstanding unequal increases in temperature, the particles of the liquid expand uniformly in relation to the average increase in temperature, the total expansion is just as great as though all the particles were at exactly the same temperature—stirring being in this case unnecessary. Petroleum, for example, is admirably adapted for this method, while water is not suitable, and its use would require a stirring device. With this calorimeter the heating value is determined by merely reading the height of the liquid in the measuring tube before and after the experiment; multiplying the difference by a constant, and dividing the product by the amount of fuel consumed. The only correction needed in any event would be for the heat lost to the atmosphere, and it has been found that this may be neglected if the quantity of liquid in the apparatus is so large in comparison with the fuel consumed that the liquid is only slightly heated by the combustion.

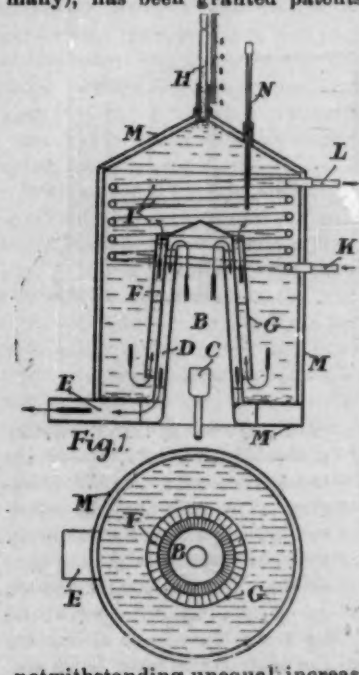


Fig. 1.

In order to keep the liquid at about room temperature it can, before each experiment, be adjusted to temperature, by a special cooling coil, I, having terminal connections, *K*, *L*.

The calorimeter vessel has a shaft, B, in which the hot gases liberated by the combustion of the fuel in the burner, *C*, ascend and pass downward again through the heating passages, *D*, and escape through the exhaust outlet, *E*. The combustion shaft and heating passages are provided with heat exchanging devices "which ensure complete transmission of the generated heat to the measuring liquid." The heat is taken up from the gases by gills in the heating passage, and is given off to the liquid mainly through gills F projecting into the liquid. A more active circulation of the liquid, and therefore an improved transmission of heat to it, are obtained by the jacket, *G*, which surrounds the gills. A graduated glass tube, *H*, is provided for measuring the increase in the volume of the liquid. The calorimeter body is surrounded by an insulating jacket, *M*, to prevent radiation of heat.

Items of Interest
FROM VARIOUS LOCALITIES.

MR. WILLIAM E. BARRETT, since 1906 prominent on the engineering staff of Messrs. J. G. White & Co., and whose latest and most notable achievement in the engineering field was the construction of a 12-inch high pressure line for conveying natural gas from the Midway (Cal.) field to Los Angeles—the details of this planning and construction were given by him in the JOURNAL for last week—has engaged on personal way in the field of consulting gas engineering on any and all accounts. His offices are in the Wall Street-Exchange Building (Suite 1902), 43 Exchange Place, New York. Mr. Barrett, besides thorough qualification for passing upon anything connected with the gas industry, has a decidedly pleasing personality, and his ways of doing business are of the sort followed by qualified engineers and straightforward men.

MR. JOHN H. SONNTAG, President, Rochester (Minn.) Light, Heat & Power Company, is being congratulated by his associates on the splendid results that are accruing from the operation of that corporation. A transcript from the accounts shows these gains: Output for January, 1914, a percentage gain of 37, as compared with the sendout for 1913; and the sendout for 1913 was 50 per cent. in excess of that for 1912.

MESSRS. C. S. GRAVATT and E. Steinen, respectively Sales Manager and Commercial Representative, the American General Selling Company, Inc., of New York City, sailed per La Provence, late last month, their objective being a business trip *in re* the gas and mantle factory, of Bale, Switzerland.

MR. IRA C. COVERT, for the past two years Division Superintendent the Central Indiana Gas Company, with headquarters in Muncie, Ind., has accepted the position as Manager, the Billings (Montana) Gas Company.

MR. GEORGE R. SHIELDS, recently an important factor on the engineering staff of the Improved Equipment Company, New York, has joined the forces of the Lloyd Construction Company, in the capacity of Engineer. The Lloyd folks have certainly secured the services of a capable man.

MR. M. WEBB OFFUTT is now in active harness, as Manager the Porto Rico Gas Company, San Juan, Porto Rico. Mr. Offutt will be particularly remembered through his recent connection with the Alabama Power Company, with the Electric Bond and Share Company, New York, and with the old Schenectady (N. Y.) Gas Company.

FINAL argument, in the complaint of certain residents of Springfield, Mo., asking that a revision shall be made of the rates charged by the Springfield Gas and Electric Company, will be heard by the Missouri Public Service Commission, sitting in Jefferson City the morning of March 3d.

THE Marion (Mass.) Gas Company has opened an office next to the structure known as the Courier Building, which will be under the direction of Mr. H. T. Buffington, assisted by Mr. K. M. Kendall.

THE Union Gas and Electric Company, Cincinnati, Ohio, is proposing an important main series extension to the outlying sections known as Sayler Park, Mt. Washington and California.

MR. ARTHUR GUTHRIE, formerly Superintendent of the Tri-State Gas Company, Toronto, Ont., and later on Superintendent, pipe line division, the Union Oil Company, Los Angeles, Cal., died suddenly in Los Angeles, on the evening of January 12th. He had been in poor physical condition for some time.

JUDGE CLOUD, of Paxton, Ills., was in Gibson, Ills., some days ago. While there he had occasion to visit the public building, it so happening that the Council was in session when he called. He was invited to listen to the deliberations of our Solons, one of whom asked him how the Paxton gas plant was meeting the desires of the public. His reply (which in some respects was certainly enthusiastic) was to the effect that it was entirely satisfactory, and was proving a positive convenience to the residents. In fact, he said, "Apart from the splendid work in the kitchens of the city, many were preferring to

use gas for illuminating their homes by means of incandescent mantles instead of by electric currents." You may take it from me that Gibson just now would be a fruitful field for people whose specialty is the construction of gas plants.—F. M. S.

ACTIVE work on the construction of the gas plant at Rocky Ford, Col., is underway. It is thought that the works will be completed by July first, when the residents of the named famous melon growing district will be able to appreciate the comfort to home that goes with a gas supply.

THE proposed new gasholder for the Des Moines (Iowa) Gas Company, is to have a rated capacity of 2 millions cubic feet. The Company is now conducting negotiations for the purchase of a "blind alley," which runs into its present site on the east bank of the Des Moines, which acquiring will complete the gaining of a suitable site for the proposed new container. Surely it seems that President Jansen Haines and his men are doing great work.

DURING 1913, the output of the Omaha (Neb.) Company reached the imposing total of $752,621,042 cubic feet. A total royalty of $37,631.50 (3 per cent. on the gross receipts) was paid into the city treasury; in addition thereto the Company paid to the city a sum equal to $25,071.74, under what is designated as the occupation tax. The tax on output account in 1912 amounted to $35,606.17.

THE royalty payment (2 per cent. on gross earnings) by the Pawtucket (R. I.) Gas Company, for the quarter ended December 31, 1913, amounted to $534.33, practically equal to the payment made on account of the final quarter in 1912.

MR. JOHN J. FITZGERALD has been appointed Chemist to the gas and electric division, the Holyoke (Mass.) municipal government.

WE understand that the Mayor and the Lighting Committee of the City Council, Athens, Ga., have inaugurated a movement to cause a reduction in the selling rate for gas, now $1.75 per 1,000, less 10 per cent. for prompt payment.

AT the semi-annual meeting of the Massachusetts Association, United Association of Plumbers, Steam Fitters and their helpers, it was decided to hold the next session in Gloucester, Mass., July 26th. The officers elected were: President, A. L. Lardner; Vice-President, L. L. Leahy; Treasurer and Secretary, F. D. McCarty.

THE sales of gas by the United Gas Improvement Company in Philadelphia during the year 1913 were quite close to ten thousand millions cubic feet. The percentage gain over 1912 was equal to 2.84 per cent.

THE Directors of the Tonopah (Nev.) Gas Company have levied an assessment of $10 per share on the outstanding stock. The delinquency or sales' period is set for the 2d prox.

"IT is President Frank D. Moses now, the famed resident of Trenton, N. J., having been elected President of the Standard Gas Company, which corporation owns the gas plant at Sea Isle City.—MANASQUAN."

AT the organization meeting of the Warsaw (N. Y.) Gas and Electric Company, these officers were elected: Directors, E. H. Morris, W. J. Humphrey, Ellis L. Philips, H. W. Frost and G. W. Olmsted; President, G. W. Olmsted; Vice-President, E. H. Morris, Treasurer, E. L. Philips; Secretary, H. R. Frost.

THE proprietors of the Scranton (Pa.) Gas and Water Company have informed the authorities that they have arranged to set 80,000 shade trees, distributed and planted over the water sheds of the Company. The trees will be of the evergreen species, including examples of hemlock, spruce, fir and Norway pine.

MAYOR MITCHEL has announced the appointment of Mr. William Williams, formerly Commissioner of Immigration, as Commissioner of Water Supply, Gas and Electricity for New York city. While one may not truthfully say that Mr. Williams is not in every sense well qualified for this important and gravely responsible position, it is nevertheless impossible to dismiss the thought it is unfortunate that the game of politics requires the non-reappointment of a man of the caliber of Mr. Williams' predecessor, Mr. Henry S. Thompson.

"B. T. L.," writing from Linton, Ind., under date of the 9th inst., says: "Some weeks ago it was rumored, with apparent show of fact, that the gas supply of Linton, Ind., would be cut off some time this month. There is, however, no truth in the story; in fact, to the contrary, the Company is expending quite a sum on plant account, for the better service of the people. While this is a natural gas field supply, you may further take it for granted, that if the natural gas source should fail us, Linton would speedily arrange for a supply of artificial gas."

THE proprietors of the Old Colony (Mass.) Gas Company report that the sendout for the first 7 months of its fiscal year (begins July 1st) was 37,153,000 cubic feet, or a 45 per cent. increase over the sendout for the corresponding time a year ago.

THE purchaser of the Iowa Falls (Ia.) gas plant—which was sold at sheriff's sale January 30th—Mr. Watson Davidson, of St. Paul, Minn., proposes to reconstruct it on a different site, in up-to-date way. Contractors might do well to bear this in present mind, for the work will be started as soon as the weather conditions permit.

WE are indebted to "W. F. B.," writing from Provo, Utah, under date of the 5th inst., for this newsy note: "The new coal gas plant has just been completed and placed in operation. The system, which is a very complete one, was from designs by Mr. Fred. W. Freese, Fort Wayne, and that capable gas engineer built the works, from foundations to the limit of the distributing scheme, and equipped the entire outfit. The central building is divided into 3 housings, the first of which contains the benches and boilers; the second, the exhauster, tar extractor, condensing and scrubbing apparatus; the third, the compressor, station meter and high pressure regulator. The main building is of brick, with concrete foundations and floors, and the roof covering consists of asbestos cement slates, laid on steel trusses. There is also a coal storage structure, of 70 feet by 20 feet. All of the apparatus is of standard design, the distribution system is of high pressure type, and while it now fairly covers the city, it is the purpose of the proprietors to lay in a considerable addition to the mileage as soon as the weather conditions permit. The plant has been so designed that when the time arrives 6 or 7 other towns in the Utah Valley can be supplied from it. The chain of towns or settlements that will eventually be hooked up is so linked as to make the scheme an ideal one. It is arranged that the first extension (to Springville and Spanish Fork, each having about 4,000 people), will be made within a year. The prospects for developing a very good business in Provo are exceptionally bright, and although the present season is not particularly favorable for the development of the cooking division of the business, nevertheless the Company's fitters and service gangs are very much behind respecting gas range installations and on business lighting equipment as well. Since coming to Provo Mr. Freese has become heavily interested in the Company, as this listing of its executive management will show: Directors, Fred. W. Freese, F. C. Richmond, W. H. Ray and A. F. Beringer; President, F. C. Richmond; Vice-President, W. H. Ray; Secretary, A. F. Beringer; General Manager, F. W. Freese."

MR. GEORGE D. BATES, for years prominent in the business and trading of Athol, Mass., and owner of a large interest in the Athol Gas and Electric Company, died at his home in Athol, the morning of the 7th inst.

"ABOUT the handsomest and most attractive exhibit held last week in the Armory Building, Taunton, Mass., is the gas show under the general auspices of the 'Poultry Show Association.' The entrance to the building was made bright as day at night by means of well-placed high powered gas arc lamps, and the interior was flooded with the light waves emitted by many Welsbach, No. 20, single burner lamps. At the gas booth every appliance that goes to make housekeeping easy was shown in most attractive manner; and, better still, competent demonstrators were in constant attendance to show that which could be done by the agency of the various appliances, prominent amongst these being the wares of the Glenwood Company. Bread and cakes were done to a turn in the Meek-Reel oven, and the garage heater decidedly took the fancy of the automobile enthusiasts, of whom we have many in Taunton, a place well-known to the gas industry at large, for it was here that whole-souled, bluff, true-as-steel, the late Harry B. Leach, did so much for his fellows that his memory remains amongst us, a most delightful reminder that good accomplished is a monument well built."

Utilities Commission News.

THE activities of the Maryland Commission for the year 1913 included the valuing of several corporations, and bearing on various subjects covering 125 days. Correspondence cases continued to be an excellent channel for disposing of minor complaints. 24,391 gas meters were tested; percentage O.K. 78.4, fast 9.2, slow 12.4. The stated average candle power was from 26.3 (August) to 21.8 (May), and heating value 614.7 B.T.U.'s (July) to 664.2 (February). These tests indicated a generally satisfactory condition of gas supplied and service. The report notes tests by the Commission of an improved flat flame burner. It includes a special valve to control pressure in the burner, and the tests show thet the saving in consumption of gas varies from 29.5 per cent. at a pressure of 1 inch of water to 63½ per cent. at 5 inches. The gain in candle power per cubic foot is from 8.36 per cent. to 17.8 per cent., according to pressure. At a pressure of 2 to 3 inches the gain is approximately 50 per cent. of gas consumed and 100 per cent. in candle power per cubic foot, due to more perfect combustion.

The Commission acknowledges assistance received from the Bureau of Standards, and states practical use was made of such assistance.

CHAIRMAN DUNCAN, of the Indiana Commission, in a recent address, made this comment on utility company's employees:

Of all the complaints which come to the commission, few are against the conduct of the managers of the companies. The chief complaints arise from the insolence of employees. School your employees in kindness and consideration toward the public. This will do much to bring the friendliness of the public to your companies. Treat the people with consideration and civility and you will remove one of the best grounded reasons for complaints against you. I suggest that the larger companies establish schools of instruction for employees.

Petty incivilities and slight neglects are not permitted among employees of private mercantile enterprises, because a great deal depends upon first impressions, and these are favorable or unfavorable according to the good manners and cordiality of those in charge. Naturally the managers demand that the first impressions shall be favorable. Public utilities companies should demand the same thing of their employees. Civility is one of the essentials of success in business, private or public.

THE city of Chicago is fighting to be made independent of the Illinois Commission, and in framing the "home rule" regulations it has been decided to eliminate all commission features from the proposed municipal public service department. As originally planned there was to be a board consisting of the city electrician, city comptroller and a commissioner of public utilities to be appointed. It is now proposed that there shall be created a new department of the city government, to be known as the Department of Public Service, in charge of one official to be called the commissioner of public service. The proposed department would include bureaus of local transportation, gas inspection, telephone supervision and electric-service supervision, the heads of the bureaus to be selected by civil service methods.

MAYOR BUSCHEMEYER, of Louisville, desired to have a new ordinance enacted enlarging the duties of the city gas and electrical inspector, establishing standards of electric and gas service, meter testing, etc. His assistants took up the subject and found they were unequal to the problem, and his Honor promptly called upon the National Bureau of Standards to send an expert to Louisville. The Bureau complied immediately, assigning Mr. R. S. McBride to the task, who will act in an advisary capacity in preparing the new ordinance.

This is one of the first instances wherein a city has intelligently availed itself of this expert and non-prejudiced assistance. Kentucky has no state utilities commission, and the questions raised by the ordinance are extremely technical. Both the public and the utility company are interested in securing fair and reasonable legislation, and the experts of the Bureau of Standards are qualified to render help in just such matters.

The Market FOR GAS SECURITIES.

The city gas share market, while it cannot be said to have exhibited any particular sign of depression, had a downward tendency, mainly because of lack of orders either for cash or the long side. In Consolidated the net result is a drop of 1¼ in the bid, the opening to-day having been made at 134 to 134½. The market for city gas bonds, however, continues active, with fractional advances in the quotations.

Brooklyn Union is rather firmy held, although the bid (126) still looks ridiculously low. All the same at not a distant date we predict it will cross 135. Lacledes were naturally higher, presumably from analyzings of the Company's accounts for 1913. These show net earnings of $2,054,005, a high record; and the gross shows a gain of virtually $100,000 in the 12 months. In all these calculatings it must be remembered the gains were made despite a 90 per cent. or over advance in oil materials used. The Lacledes balance, net, applicable to dividends on the common, equaled 8.16 per cent The fund applicable to dividends on the common was increased to $390,856, or about 3.6 thereon. Operating expenses and taxes increased 3.2 per cent., as against an 0.7 increase in 1912; 6 per cent. was added to the depreciation reserve, which is now $577,362, as of December 31st, 1913. Altogether, the situation of the Company is excellent.

"Rights" respecting the new issue of Baltimore Consolidated are bid 37½ cents, but holders almost generally will exercise these on personal account. The shares are bid 106. All shares paid in full by March 20 will share in the dividend for quarter ending March 31st.

The Washington (D. C.) situation is about as well clarified as the waters of the Potomac, but the quotation for Washington gas shows the inherent strength of the property.

The proprietors of the Consumers' Gas Company, Toronto, Canada, are about applying for permission to sell new stock to current shareholders, at a fixed price, instead of the present requirement of disposing the same at auction or by other tender. The present stock is quoted at 190 to 205.

GAS STOCKS.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

FEBRUARY 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$99,816,500	100	134	134½
Central Union Gas Co.—				
1st 5's, due 1927, J. & J.	3,500,000	1,000	101	103
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	101	104
Mutual Gas Co.	2,400,000	100	157	157
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	99	101
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	59	62
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	102	105
Con. 5's, due 1945, J. & J.	1,500,000	—	98	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	102
Standard	5,000,000	100	102	104
Preferred	5,000,000	100	93	94
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	91	95
The Brooklyn Union	15,000,000	1,000	126	128½
1st Con. 5's, due 1948, M. & N.	15,000,000	—	102	103
Yonkers	999,650	500	180	—
Out-of-Town Companies.				
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Chicago Gas Co. Guaranteed Gold Bonds	7,660,000	1,000	104	106¼
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	94	96
Bonds	75,000	—	—	100
Cincinnati Gas and Electric Co.	29,500,000	100	67	69
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Consolidated, Baltimore	13,460,084		118¾	119
Mortgages, 5's	3,400,000	—		—
General Mortgage 4½	19,661,000	—		—
Con. Gas Co., Baltimore City, 4½	2,751,000	—		—
Columbus Gas Light & Fuel Company	1,662,750	100	65¼	66¼
Preferred	3,026,500	100	33	35¼
Detroit Gas Co., 5's	381,000	1,000	75	80
" Prior Lien 5's	5,619,000	1,000	97	100½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	133	136
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Massachusetts Gas Companies, of Boston	25,000,000	100	93¾	94
Preferred	25,000,000	100	92¾	95
Laclede Gas Co., St. Louis	10,000,000	100	99	100
Preferred	2,500,000	100	—	102¾
Bonds	10,000,000	1,000	102¾	103
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	
Montreal L. H. & P., Canada	9,000,000	100	224	225
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	122¾	123
1st Mortgage	20,100,000	1,000	102	103½
2d "	2,500,000	1,000	104	—
Pacific Gas and Electric Co.	15,500,000	—	43	43¼
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	900,000	1,000	113¾	115
General Mortgage, 5's	8,447,000	1,000	94	96
United Gas Imp. Co.	55,502,910	50	170	171
Washington (D. C.) Gas Co.	1,600,000	200	440	442
Western Gas Co., Milwaukee	4,000,000	—	—	—